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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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THE NOTABLE OPERATION OF THE KANSAS CITY SOUTHERN.

The Kansas City Southern, in saving for net earnings more than its entire increase in gross during the fiscal year just ended, has made a record which is probably unique among the more important roads during recent years. It was to be expected that, other things being equal, the company would this year be able to decrease its operating ratio because last year's maintenance expenses included large amounts spent for rehabilitation. The road was left in bad shape at the end of 1905. But this chance to improve its showing was more than offset by the higher costs of material and work which, during the past fiscal year, have greatly increased the operating ratio on most roads. The results under consideration are, therefore, to be credited to the management of the road and not to general conditions.

How these results were obtained is worth studying in some detail. The methods followed are perhaps not uncommon, but their success is uncommon. In June, 1906, estimates of the amounts to be spent on maintenance and conducting transportation, based on experience in 1906, were made. Then, throughout the year, close track was kept by watching detailed monthly reports and whenever any item was larger than the standard that had been set, inquiries were made until the waste was stopped or a satisfactory explanation found. The probable cost of maintenance could be figured closely, after several weeks of careful inspection had furnished data for estimating how much rolling stock, track material and supplies would be needed for renewals. The chief element of uncertainty was the cost of labor, usually amounting to about 30 per cent. of maintenance expenses. In 1906 maintenance cost 29 per cent. of gross earnings. The estimates did not call for reduction of this percentage, but a system was put in force looking toward getting better results from the same amount of money. The maintenance of way engineers were allowed the usual margin of 10 per cent. over the estimated cost of the work to be done and were then told that what they saved could be spent on some improvement they particularly wanted but which had not been approved. This form of "bonus system," which has worked out well in the East, was new to the Kansas City Southern engineers, but results were noticeable as soon as the men got used to it. Conducting transportation cost, in 1906, 38 per cent. of gross earnings. The management saw no reason why this should not be reduced to about 30 per cent.; as a matter of fact it was brought down to 33 per cent. The big saving was made by increasing the average train load and the car mileage. The road has no low grade operating division, gradients of about 1 per cent. being scattered over the whole line and opposing about equally both the north- and southbound traffic. The reduction of these grades has been figured on, but nothing has been done yet because of the financial situation. The train load was increased not by using heavier locomotives but by getting a larger backhaul. The great bulk of the traffic had been northbound, consisting mostly of lumber from Louisiana, Texas and the southern part of Arkansas for shipment to Kansas City. The traffic department has directed especial energy toward getting a backhaul south, and it has succeeded in getting enough more manufactures and grain, particularly the former, to greatly increase the southbound train load, although this is not yet as large as the northbound. The average car movement was about 20 miles a day a year ago; this increased to 34 miles in October, 1906, but has since fallen off to about 29 miles. The responsibility for the small car movement in previous years rests on the transportation officers, who failed to make the shippers handle the cars faster. When the requisite activity was infused into this department, the resulting quicker movement of freight attracted southbound traffic and had a gratifying effect on gross earnings. The monthly statements of earnings which have been made public throughout the year show that after the first few months the improvement was steady and rapid. The yearly results are surprisingly close to the original estimates. Gross earnings for the 12 months ended June 30, 1907, were $9,290,000, an increase of $1,530,000, or 20 per cent.; operating expenses, $5,490,000, a de-

crease of $160,000, or 3 per cent., leaving net earnings of $3,800,000, an increase of $1,690,000, or 80 per cent.

THE COLLISION AT SALEM, MICHIGAN.

The terrible butting collision near Salem, Mich., July 20, in which 33 persons were killed, reported in the *Railroad Gazette* of July 26, was due to a mistake in reading the schedule of the special train. This schedule was in the shape of a written train order, a slightly reduced fac-simile of which will be found on another page. The schedule was delivered to the freight at Plymouth. The error in reading "Salem.....9:25" instead of "Salem.....9:10" was due evidently to the failure of the person reading to follow the line of dots connecting the word with the figures. It would appear that in the first writing of the order, the time at Brighton (8:39) was omitted, and that it was inserted afterward, and the dots then put in to guide the reader.

As both conductor and engineman are required by rule to know the correct reading of an order, it will be seen that the cause of this collision was careless reading by two or more men of an imperfect order. The order is imperfect, not only because the time for Plymouth is on a level with the word Salem, but also because the dots making up the lines are insufficient. The dots should be larger and there should be more of them. Indeed, a strict construction of the rules for writing orders would require that in a case like this the order should be torn up and then be resent by the despatcher to enable the operator to make a new and correct copy. But, as everyone knows, it would require unobtainable vigilance by the superintendent to enforce such a high degree of care. A cautious conductor would have taken special care with an order of this kind. Any conductor of experience would see that it was not a satisfactory order. A document involving the safety of lives and property when presented in this shape challenges its reader to extreme caution. A conductor determined to avoid any chance of mistake would not be satisfied to read the Salem line alone by itself. He would read the whole order with sufficient care to grasp the entire schedule of the extra train. In doing this he would by force of habit see that "9:25" at Salem indicated abnormally low speed. This would lead him to re-examine the other items in the schedule.

The order was received by the night operator, a young man 22 years old, about 2:27 a.m. and was delivered by the day operator about 8.40 a.m. The day operator says that he remembers the conductor's reading it aloud to him correctly. If this is so, the conductor's fault evidently must be classed as mechanical reading. He read it, but did not give thorough attention either with his eyes or with his ears. Once the wrong impression is made, it is easy to make the same error in reading to the engineman or the fireman or the rear brakeman, if we may judge by what has been brought out in similar cases before. The freight was to stop at some point between Plymouth and Salem and unload two carloads of cinders. The day operator says that he reminded the conductor that he had not time to do that work and still reach Salem in time to clear the extra. If this is so it is one more evidence that the conductor was not giving sufficiently careful attention to the order.

The newspapers have made much of the alleged fact that the train despatcher had been early informed that the freight had left Plymouth without sufficient time to reach Salem, and yet that he did nothing to prevent the collision. If this is so, and if some means existed by which the despatcher could have communicated to one train or the other, the fact may have some bearing on the alertness of the despatcher; but it has no value as a lesson. The prevention of collisions is not to be accomplished by educating despatchers to perform lightning calculations and to do unheard of feats in emergencies. It is a fine thing to have despatchers who can do such things, and we all praise them when we hear of such strokes of genius; but to talk of prescribing in advance that such procedures shall be carried out, or that any despatcher shall be held accountable for not seeing every possible opportunity to do something, is idle.

The causes of this collision have been given in detail; not because it is proposed to discuss the faults in the details and the means of correcting them, but simply as an interesting exhibit of how the time-honored American train despatching system breaks down. The only way to cure these faults is to abolish the system and use in its place the block system. We must accept as an incurable defect in American railroad operation the continued employment of men who will occasionally make such mistakes as were made in this case. In setting forth what an ideal freight conductor would have done in this case we have implied a standard of proficiency which must be regarded as unattainable. That is to say, no superintendent of a large road can assure himself that he can attain it in all of his men all of the time. Our train-despatching system is, indeed, time-honored, but it is not worthy of confidence. The non-automatic block system is suitable for roads of the lightest traffic and cannot reasonably be objected to because of its cost. It is not free from chances of error, but it is simplicity itself compared with the despatching system, and simplicity tends to enhance safety.

If we may judge by the action of a number of other roads during the past ten years, the road on which this collision occurred will now proceed to install the block system on a considerable part of its lines. In our list of notable disasters we can at a glance pick out 40 collisions which have occurred within the past 20 years, killing an average of 20 persons each, or 800 in all, all due to causes of the same general nature as those which figured in this case; and a psychologist, desiring to estimate the influence of collisions on railroad directors' minds, could, if he had the inside facts of these 40 cases, make out an instructive exhibit of cause and effect—collisions as causes and orders for block signals as effects; with possibly as a side light an estimate of the number of lives sacrificed to establish each hundred miles of block signals. The failure of the Federal Government and of most of the state governments to establish competent inspectorships or any suitable and authoritative means of giving to the public correct statements of facts and rational lessons therefrom is an invitation to anybody and everybody to propose remedies for railroad disasters. This particular disaster will, no doubt, bring out at least a dozen amateur cures for everything, from boiler explosions to sleepy brakemen.

Is this country so big, and is our collision problem so scattered, that American railroad officers will never concentrate their energies on its effective settlement?

TAKING RAILROAD PROPERTY WITHOUT DUE PROCESS OF LAW.

"The Constitution of the United States declares that no individual shall be deprived of his property without just compensation, or without due process of law. . . . If a law were passed by a legislature contrary to the Constitution, taking from a man his home or interfering with his lawful enjoyment of it, there is no one, thus deprived, who would not ask, through the courts, the protection of the Constitution for his lawful rights. Every good man would applaud his action and would uphold his hand. If, however, legislation is enacted contrary to the Constitution taking from a railroad company its property or interfering with its lawful enjoyment of it and an effort is made by those charged with the responsibility for the property, to obtain for it in the courts constitutional protection, there are those who declare that this is a defiance of the popular will . . . an arrogant refusal to accept the popular verdict. Instead of a firm and determined insistance on Constitutional protection, the railroad manager is confronted with denunciation, with obstruction, with threats of reprisals and with efforts at intimidation."—*President Finley, of the Southern Railway, to the Board of Trade of Nashville, Tenn., July* 17, 1907.

"If this kind of obstruction should prevail and citizens are thus to be denied the rights guaranteed them by the Constitution of the United States, then those provisions of the Constitution [providing that no person shall be deprived of property without due process of law] would become a dead letter, as there would be no means of enforcing them."—*Justice Pritchard, July* 29, 1907.

The first of these quotations, from President Finley's speech at Nashville a little more than two weeks ago, is peculiarly apt in describing, prophetically, the latest developments in the dispute over the new passenger-rate law in North Carolina, of which we spoke last week. Then the situation was that two agents of the Southern Railway, arrested and sentenced to the chain gang for selling tickets at a rate of more than 2¼ cents a mile, the rate established by the last North Carolina legislature, had been released on writs of habeas corpus issued by the United States Circuit Judge. In his opinion accompanying this action, Justice Pritchard took occasion to condemn the heavy penalties prescribed by the state statute and the methods of the state authorities in instituting criminal prosecutions against the railroad's agents. In spite of his sensible words, the state authorities, headed by the Governor, besides arresting Mr. Finley himself, who had come to the scene of action to help straighten out the tangle, threatened to call a special session of the legislature to annul the charter of the old North Carolina Railroad, which runs from Goldsboro to Charlotte, 224 miles, and is one of the constituent parts of the Southern Railway lines. A compromise plan suggested by one of the assistant attorney-generals of the United States sent by the Department of Justice to North Carolina on this special mission, was rejected by the Governor, who insisted that no compromise would be entertained

until the railroads agreed to immediately adopt the new rate. On July 27 a compromise was reached between the Governor on the one hand and the Southern Railway and Atlantic Coast Line on the other, containing the following agreements:

(1.) The railroads to put the 2¼-cent rate in effect not later than Aug. 8, 1907.

(2.) The State to appeal from the order of Judge Pritchard discharging parties in Asheville on writs of habeas corpus.

(3.) The Southern Railway to appeal to the Supreme Court of North Carolina in the Wake County case, and if the case is there decided against it, to take the case by writ of error to the Supreme Court of the United States.

(4.) Both sides to co-operate to have both of these cases advanced, argued together and speedily determined.

(5.) The State at its option to indict the Atlantic Coast Line in one case.

(6.) All indictments and prosecutions now pending to be dismissed and no other indictments or prosecutions to be instituted for any alleged violation of the law up to the time the new 2¼-cent rate is put in effect under this arrangement, so far as lies within the power of the Governor.

(7.) The Governor to advise all people against bringing any penalty suits pending final determination of the questions involved and to ask the people as a whole to acquiesce in this arrangement.

(8.) The suit pending before Judge Pritchard to be diligently prosecuted, without, however, the State's waiving any question of jurisdiction.

Later in the day, the Governor made public a statement in which he referred to the acceptance of this agreement by the railroads as a victory for State rights and the people's rights against "the oppression of the railroads [and] the interference of the Federal courts." It is a victory, but there is nothing to be proud of in the methods by which it was gained. In the same petitions in which they surrender the protection of the Federal court, the two railroads declare that the agreement was assented to under duress, because of threats that if they did not assent, worse things would happen to them. They point out that by similar methods of "coercion and intimidation" the state could fix the passenger rate at 1 cent and compel the railroads to put it in force, although obviously unconstitutional. The state's present victory was gained by threats of retaliation in entirely different fields than the one under dispute, a method which in the case of an issue between individuals would be called blackmail.

It will be observed that in this whole controversy the real point at issue was whether or not the railroads should put the reduced rate in force while its fairness was being judicially determined. At the direction of Justice Pritchard, who had also earlier issued the injunction suspending the operation of the law, the railroads were giving with each ticket sold at the old rates a refund coupon, representing in each case the difference between the existing rate and the rate proposed by the new law. These coupons were to be valid if the law were finally upheld. This is a much fairer method of procedure than the one which the railroads, under pressure of threats from the state officers and unwilling to suffer the odium of what would be alleged as law breaking, have finally agreed, though under protest of duress, to adopt. The case of the fare from New York City to Coney Island clearly brings out this point. In August, 1906, a New York judge, in an obiter, announced it as his opinion that the fare of 10 cents charged by the Brooklyn Rapid Transit Company to Coney Island was illegal and that 5 cents was all that should be charged. Rioting followed, and the company sought determination of this question in the courts. Pending decision of the legality of the 10-cent fare, the company issued for each fare paid a rebate coupon good for 5 cents if the 10-cent fare were overthrown. Five months later, the highest court in New York State decided that a 10-cent fare to Coney Island was legal.

Under this method of procedure no one suffered. Both the railroad company and its passengers were protected. On the other hand, if the Brooklyn Rapid Transit had been forced to charge only 5 cents while the law was being passed upon by the courts, it would have had no means of recovery for the difference between the 5 cents paid and the 10 cents which should have been paid during the intervening five months before the law was declared void. To sue hundreds of thousands of passengers, each for a small sum, is impracticable; a railroad corporation is a responsible party. The North Carolina passenger-rate dispute as now compromised is an example, first, of the loss which will unjustly fall on the railroads in that state if the reduced rate is overthrown in the United States Supreme Court; and, second, of the sort of inconsistent hostility to railroads described by President Finley at Nashville. The whole incident is important, not so much because of its conflict between State and Federal authority, as because the railroads have not been able to obtain the protection which would have been granted, as a matter of course, to any citizen.

NEW PUBLICATIONS.

Electric Railway Engineering. By H. P. Parshall and H. M. Hobart. New York: D. Van Nostrand Co. 475 pages; 7 in. x 11 in.; 437 illustrations; cloth. Price, $10.

It is refreshing to take up a work dealing with electric traction on a large scale and not feel that one must be constantly on guard against overstatements and exaggerated estimates, and in which the main idea of the author is not to decapitate the steam locomotive but to tell what really can be done. The authors of this book have evidently gone on the principle that "good wine needs no bush," and so in the first words of their preface they say that "the considerations which have led to the adoption of electric traction on the larger steam railroads have generally been peculiar to the local circumstances"; and that "in the application of electricity to long distance lines, it is to be steadily borne in mind that the steam locomotive has demonstrated itself to be the most efficient self-contained machine, considering its varying functions, that the engineer has yet devised. To compete with this machine, every appliance entering into the electric traction installation must compare from every point of view, as regards efficiency, with this most highly developed and perfect mechanism. The electric locomotive installation duplicates, in many respects, the steam locomotive installation." These quotations are given to show the mental attitude of the authors, and that they are not among those who have donned their funeral habiliments or festal dress—according to the point of view—to attend the obsequies of the old iron horse.

While the book is issued from the press of an American firm it has an English viewpoint throughout, which perhaps accounts in part for its conservatism. The first chapter deals with the old problem of traction and acceleration. This it does thoroughly and at some length, entering carefully into details of tests and results, giving tables of factors and data required for the solution of its formulae; but, on the whole, it considers that the formula evolved by Aspinall is as reliable as any because "little interest attaches to tractive resistance at speeds of less than 10 miles per hour," while, for speeds greater than that, this formula "leads to very trustworthy results." This covers tractive resistance at constant speed. Then follows a chapter on acceleration. This has many diagrams, showing curves of resistance and speed, and these serve "to bring out very forcibly the limits of attainable average and 'schedule' speeds and to show that for a one-mile run between stops an average speed of 45 miles an hour is practically unattainable." With these diagrams comes consideration of the part that can be played by various types of equipment in obtaining results, and how the weight of this equipment rises if a high rate of acceleration without undue heating is to be maintained.

The book then goes on to give an analysis of the tractive force and the power and energy at the axles, and then takes up the characteristics of railroad motors. Here again a word of caution is sounded in reference to the fact that high schedule speed involving frequent stops and rapid acceleration can only be obtained "at very disproportionately increased cost." The discussion throughout the chapter hinges about the a.c. single-phase motor, and the conclusion that is dispassionately drawn is that the d.c. motor is superior. The electric power generating plant is taken up in detail and its working analyzed; and the designer is warned against a too great refinement, lest he may find to his cost that "thermal gains are not always commercial gains."

High tension transmission, sub-stations and the distributing system follow and after them a fully illustrated chapter on locomotives and motor cars, special attention being given to the work on the New York Central, the Baltimore & Ohio and the Valtellina Line in Switzerland, as well as the apparatus used in the Berlin-Zossen trials. In this chapter there is another criticism of the single-phase system, in the statement that "from the standpoint of its technical merits, the single-phase commutator motor is at present a factor in the railroad electrification problem only in so far as the possibility of its further improvement at an early date entitles it to consideration. Although the last three years have witnessed the advent of several types of single-phase commutator motor, each of which constitutes a great step in advance of the old induction type single-phase motor without commutator, there is still a wide gap to be bridged before it can, on the basis of its engineering merits, rival the continuous-current motor. The single-phase motor has the non-technical advantage that it is now fully realized that some radical innovation is essential to the success of railroad electrification. It appeals to the speculative instincts of human nature to take up a promising novelty rather than undertake radical but comparatively uninteresting modifications of a well-tried and reliable system, especially as there is a prevailing belief that this would only postpone the inevitable, ultimately successful, introduction of an alternating current railroad motor. It will, however, not be denied that a treble or quadruple increase in the traditional continuous-current trolley voltage would greatly increase the practicability of introducing electric traction on main railroads without discarding continuous-current railroad motors." This certainly is a clean-cut non-partisan statement of the present situation. Con-

tinuing this subject it is said: "The preparation of a rigid quantitative comparison is, in such a case as this, beset with difficultes, but it should be evident from the data set forth, that pending considerable further development, the continuous current motor has as yet no rival for city and suburban work.

"For interurban work, it is believed that the 600-volt continuous-current motor can generally hold its own; nevertheless there appears insufficient reason why advantage should not be taken of the higher economies incident to employing higher voltage at the motor."

The last chapter of the book is devoted to trucks and many of the more prominent types are illustrated and described in detail. The authors express a decided preference for the European type of truck as compared with the American, and doubt the desirability of equalizing between the wheels. In this they state, however, that the preference for the European model is confined to European engineers for they have no record of any adoption of the type in the United States.

There is at the end an exceptionally good index, which, as the book is to be used for rapid and ready reference, is most essential.

Wrentmore's Batter Tables. By C. G. Wrentmore, C. E. New York: Engineering News Publishing Co. 8 in. x 9½ in.; 197 pages; cloth. $5.00.

This is a book of tables for determining the length of braces, diagonals and rivet spacing when the batter or inclination of the part to the base is known. There are 192 tables for batters ranging by sixteenths from $^1/_{16}$ in. to 12 in. to the foot, a page being devoted to each, and each of these tables are given in two sections. One gives the length of the hypothenuse for any base from $^1/_{16}$ in. up by sixteenths, and the other gives the altitude for the same base dimensions. All dimensions in the tables are given in decimal fractions of a foot, and these are readily converted to nearest sixteenths for use on drawings by means of a conversion table on the inside of the front cover that gives the equivalent decimal fraction of a foot for all measurements from $^1/_{32}$ in. to 12 in., increasing by increments of 30 seconds. The tables will undoubtedly be a great convenience, especially to those who are working out details of structural iron and steel.

CONTRIBUTIONS

Fuel Consumption of Gasolene Motor Cars.

Omaha, July 26, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to editorial in the *Railroad Gazette* of June 7:

The figures as to the relative cost of gasolene and steam cars must have been based on some old style, impractical gasolene car. These statistics show the cost of gasolene as $7.50 per 100 miles as against oil at $4.90 per 100 miles and coal at $2.69 per 100 miles, making it appear that gasolene motors are highly expensive to operate as compared with steam. As far as the Union Pacific is concerned, this figure for gasolene is wrong, as accurate statistics show that Union Pacific motor cars are being operated at a cost of $3.36 per 100 miles for fuel. This figure covers a period of operation of more than two years and shows the cost to be less than one-half the amount shown in the table printed with the article in question.

W. R. M'KEEN, JR.,
Supt. M. P. & M.

The Salt Lake City Union Station.

Chicago, Ill., July 29, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the criticism of the Salt Lake City union station by "S" in your number of July 26th: Your correspondent evidently does not understand the plans, or the operating conditions at Salt Lake City, which are not at all similar to the way stations he refers to. That city, in common with many such locations in the West, is a terminal point from which trains, many of them short locals, originate in both directions—east and west. There are, however, a few through trains, and it is intended to take care of these on the last track or two from the building proper. The other trains originating here will stand with their rear ends at the platform designated in the drawing as "train shed," for which there is ample track length, as is shown in the general yard plan.

It is true that the umbrella sheds are 440 ft. long, but this does not mean that the trains themselves are restricted to this length, because the climatic conditions include no intense heat, and a very short winter season, during which time only it is necessary to protect passengers going to and from trains, which are then shortest, and an umbrella shed 440 ft. long, which allows accessibility under cover to the platforms of about seven cars, is sufficient for this purpose. It would seem to be absurd to compel passengers to climb stairs and go over bridges, or through tunnels, when all trains are perfectly accessible on the "archaic" level. This would seem to dispose of the objections raised to the arrangements for handling passengers.

There are no "island" platforms shown in this plan in the sense of platforms elevated above the rail between the tracks; but the entire floor of this building, as shown in the end elevation published, is level with the top of the rails.

Regarding the handling of baggage: It is both feasible and intended at this place to handle most of the baggage by setting baggage cars on the spur track shown in the plan opposite the baggage room, which gives a minimum of trucking and handling. It is true that there will be some little late baggage which will have to be trucked, and to avoid crossing tracks which may be occupied by trains, the tunnel, with lifts as shown, is provided. It is expected that practically all of the mail and express will be similarly handled to and from cars set in on the spur provided for that purpose; and it may be noted that at present this is the arrangement satisfactorily used at this place. It is true that some little trucking may be necessary with this as with any arrangement of depot. Complete tunnels for handling baggage, express and mail have been discussed but are regarded as unnecessary under the conditions.

The reasons given above are so obvious that this explanation seems hardly necessary to any one at all familiar with this subject.

JOHN D. ISAACS.
Consulting Engineer, Bridges, Buildings & Structures,
Harriman Lines.

Government Accident Bulletin No. 23.*

The Interstate Commerce Commission has issued Accident Bulletin No. 23, containing its report of railroad accidents in the United States during the three months ending March 31, 1907. The number of persons killed in train accidents was 421, and of injured 4,920. Accidents of other kinds bring the total number of casualties up to 20,563 (1,293 killed and 19,270 injured). These reports deal only with (*a*) passengers and (*b*) employees on duty. Under "passengers" are included postal clerks, express messengers, employees on Pullman cars, newsboys, live-stock tenders, men in charge of freight, etc.

TABLE NO. 1.—*Casualties to Persons.*

	Passengers.		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	52	1,349	163	1,431	215	2,780
Derailments	58	1,050	82	629	140	1,679
Misc. train accidents, incl. boiler explo..	16	75	50	386	66	461
Total train accidents	126	2,474	295	2,446	421	4,920
Coupling or uncoupling	..	..	62	947	62	947
While doing other work about trains	..	..	78	4,558	78	4,558
In contact with overhead bridges, etc...	2	4	26	407	28	411
Falling from or getting on cars or engs.	34	432	176	3,220	210	3,652
Other causes	22	426	472	4,356	494	4,782
Total (other than train accidents)..	58	862	814	13,488	872	14,350
Total, all classes	184	3,336	1,109	15,934	1,293	19,270

The number of employees killed in coupling accidents in this quarter shows a diminution of 25 per cent. as compared with the quarter last preceding or with that of one year ago. This is a gratifying indication of an improvement in safety appliances, which it is to be hoped will be maintained. The other principal items in the present record show no important changes as compared with the last preceding quarter, which was marked by large aggregates of both killed and injured. The number of passengers now reported killed in train accidents (126) is, indeed, 30 per cent. smaller; but the record includes two collisions (Table 2*a*, Nos. 30 and 31) killing 41 persons and two derailments (Nos. 1 and 18) killing 41; and the total of 126 is more than twice the total of this quarter in 1906.

The principal items in the present bulletin, compared with the last preceding quarter and with the quarter one year ago, appear as follows:

	Bulletin No. 23.	Bulletin No. 22.	Bulletin No. 19
1. Passengers killed in train accidents	126	180	62
2. Passengers killed, all causes	184	234	114
3. Employees killed in train accidents	295	294	212
4. Employees killed in coupling	62	84	84
5. Total passengers and employees killed, all causes	1,293	1,430	1,126

TABLE NO. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	538	$499,565	50	586
" butting	279	630,518	93	1,101
" trains separating	194	52,977	2	110
" miscellaneous	1,067	652,199	70	983
Total	2,078	$1,835,259	215	2,780

*The five most serious accidents are collisions 30 and 31, and derailments 1 and 18, in Table 2*a*, and the explosion noticed in the last paragraph of the report. These accidents may be identified by reference to the *Railroad Gazette* records as follows:

Collision No. 30, Alta Vista, Kan., Jan. 2.
Collision No. 31, Fowler, Ind., Jan. 19.
Derailment No. 1, Williamsbridge, N. Y., Feb. 16.
Derailment No. 18, Colton, Cal., March 28.
Explosion at Sandford, Ind., Jan. 19.

In the cases of the two collisions the Government's report contains some interesting details concerning the causes which were not given in the earlier accounts.

Derailments:				
Due to defects of roadway, etc.....	427	$339,268	23	323
" defects of equipment.....	771	619,604	5	259
" negligence of trainmen, etc.....	122	73,673	32	227
" unforeseen obstruct'n of track,&c.	135	182,645	22	210
" malicious obstruction of track, &c	16	42,177	5	79
" miscellaneous causes	442	443,484	53	581
Total	1,913	$1,700,851	140	1,679
Total collisions and derailments....	3,991	$3,536,110	355	4,459

Following is the usual list of Class A train accidents—all in which the damage is reported at $10,000 or over; notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

TABLE No. 2a.—*Causes of Fifty-one Prominent Train Accidents (Class A.).*

[NOTE.—R., stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

COLLISIONS.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
1	M.	F. & F.	7	20	$800	34	Employees killed and injured in a caboose, being pushed on yard track; butting collision; both trains disregarded yard speed limit.
2	M.	F. & F.	0	1	1,250	64	Freight train moving from side track to main track at night struck by following freight. Markers had not been turned from green to red, and brakeman had turned switch without looking at electric indicator connecting with automatic block signal.
3	B.	F. & P.	0	2	3,000	98	Empty engine started from interlocking station on wrong main track; intended to run through crossover and signalman had cleared the signal, but did not throw crossover switch; signal had but one arm, which is cleared for either of the two routes; engineman on duty 17 hours.
4	M.	P. & F.	0	1	3,200	67	Switch out of order; signalman gave clear hand signal, assuming, erroneously, that switch had been spiked by repair man.
5	B.	F. & F.	0	7	4,118	19	Illegible train order; order written 3d 73; taken to read 2d 73; operator failed to check order when it was read aloud in his presence; despatcher caused unnecessary confusion by putting two orders in one.
6	B.	F. & F.	0	1	4,582	33	Engineman misread despatcher's order. (See note in text below.)
7	B.	P. & P.	1	18	4,700	23	Engineman misread name of station in despatcher's order; order legibly written; conductor had not properly delivered order to engineman; gave order to brakeman; brakeman gave it to fireman and he to the two enginemen of the two engines.
8	R.	F. & F.	2	2	5,250	16	Engineman ran past 2 automatic block signals set against him.
9	B.	F. & F.	0	0	5,970	5	Despatcher sent order to 2d and 3d No. 50 when it should have been sent to 1st and 2d No. 50. (See note in text below.)
10	B.	P. & F.	1	26	6,262	101	Freight train backing into side track; rear part broke loose and ran back down grade into head of passenger train. Conductor set hand brakes but could not stop cars until too late. Air brakes had been bled because of the bursting of a hose.
11	B.	P. & P.	4	107	7,745	97	Regular eastbound passenger train ran past meeting point.
12	M.	P. & F.	1	42	8,000	4	Misplaced switch. Switch had been opened by man in charge of freight train, intending to enter main track thinking that the passenger train (No. 4) had passed. The train which had passed was No. 2.
13	B.	F. & F.	3	2	8,500	53	Conflicting train orders, 12:30 a. m. Despatcher at fault was 39 years old, experienced in train and telegraph work, but had served only 1 night as despatcher. He forgot an order which had been issued by the other despatcher about an hour before. Had not receipted for this outstanding order.
14	M.	P.	0	6	9,567	29	Misplaced switch at station. Target of switch covered with snow.
15	R.	P. & P.	1	15	10,100	30	Approached station (8 p.m.), not under control; faulty flagging.
16	R.	F. & F.	2	5	11,000	21	Excessive speed, and failure of standing train to flag.
17	R.	P. & P.	0	11	11,025	9	False clear block signal. (See note in text below.)
18	B.	F. & F.	0	3	11,100	88	Eastbound ran past signal at meeting point at 4 miles an hour.
19	B.	P. & F.	0	11	11,170	31	Westbound passenger train disregarded wait order. (See note in text below.)
20	B.	P. & F.	2	12	11,300	63	Westbound extra freight (2 a.m.) neglected to head in at entrance to side track; engineman asleep.
21	R.	P. & F.	6	1	11,900	6	Freight followed passenger train from station (4 a.m.) within 5-minute time limit and ran into passenger train unexpectedly stopped; weather very cold.
22	R.	P. & F.	0	16	12,000	55	Passenger train unexpectedly stopped (3 a.m.) run into at rear by freight. (See note in text below.)
23	M.	P. & F.	5	3	12,400	58	Extra freight entered main track in face of fast train, disregarding automatic indicator at switch. (See note in text below.)
24	B.	P. & F.	1	47	14,600	100	Eastbound freight backed into side track; neglected to set switch straight, though westbound passenger train was then due. Engineman on passenger train, approaching at 50 miles an hour, had his attention diverted from switch by excited actions of freight train men.
25	M.	P. & F.	2	26	15,000	61	Freight on passenger track fouled main track. (See note in text below.)
26	B.	F. & F.	1	3	15,933	59	Northbound train disregarded meeting order. The order said "meet engine 567." At the meeting point engine 565 was on the side track and this was taken for 567. The northbound train passed without stopping.
27	M.	F. & F.	1	1	18,844	18	Runaway on steep grade; engineman continued using steam too long after passing summit.
28	M.	P. & F.	0	3	21,900	66	Passenger train disregarded distant and hose automatic block signals; ran into side of freight train. Fireman had called clear signals to engineman without seeing signals; engineman also ignored rule requiring an all-right hand signal at this point.
29	B.	F. & F.	1	3	27,102	8	Runaway on grade. See note in text below.)
30	B.	F. & P.	32	75	31,100	11	Operator failed to deliver order. (See note in text below.)
31	B.	P. & F.	9	8	48,500	10	Passenger train ran past block signal and freight disregarded time limit. (See note in text below.)
32	M.	P. & F.	0	15	73,625	27	Maliciously mispiaced switch; damage largely due to fire.
33	B.	P. & F.	5	11	75,300	1	Misplaced switch. (See note in text below.)
Total.....			87	504	$516,843		

DERAILMENTS.

1	D.	P.	19	149	$2,600	79	Unexplained. (See note in text below.)
2	D.	P.	2	15	.....	106	Broken rail.
3	D.	P.	0	12	5,650	77	Derailing switch thrown under train by repairmen testing interlocking apparatus.
4	D.	P.	0	2	6,500	78	Broken rail. One passenger car destroyed by fire which started in oil lamps.
5	D.	P.	3	3	8,747	73	Engineman (who was killed), disregarding slow order, ran into side track at 50 miles an hour. Engineman thought to have been asleep; fireman had spoken to him about excessive speed, but not with the necessary determination and energy.
6	D.	F.	1	0	9,350	76	Open draw.
7	D.	P.	2	49	10,500	121	Maliciously misplaced switch.
8	D.	P.	1	5	11,260	82	Broken rail.
9	D.	P.	6	11	15,119	38	Misplaced switch; occurred 4 a.m.; no lamp on switch. (See note in text below.)
10	D.	F.	0	3	16,000	37	Runaway on 3 per cent. grade; negligent management of brakes; hand brakes were in use, power brakes alone being deemed unsatisfactory for so steep a grade.
11	D.	F.	1	1	16,750	117	Roadbed washed out at side by flood in river; engineman is said to have been keeping good lookout and to have thought roadbed intact. Track inspected one hour before and traversed by a train 30 minutes before.
12	D.	F.	0	1	17,055	42	Unexplained.
13	D.	P.	3	35	18,700	47	Unexplained.
14	D.	P.	1	1	21,500	75	Switch out of order; rod maliciously loosened; switch new and in good condition 2 days before. Wreck mostly destroyed by fire, which started from heater in car or from lamps.
15	D.	F.	3	0	22,000	118	Middle pier of bridge gave way as train passed over; undermined by flood believed to have been caused by cloudburst. The dam caused by the wreck divided the stream in such a way as to destroy both abutments.
16	D.	P.	1	23	29,430	69	Unexplained; believed some part of engine broke and fell to the ground; speed, 28 miles an hour.
17	D.	P.	0	44	60,000	81	Brake-beam on rear truck of tender fell on track and derailed cars.
18	D.	P.	22	116	28,685	115	Misplaced switch; engineman failed to keep good lookout, and approached yard at too high speed. (See note in text below.)
Total.....			65	470	$299,846		
Grand total.			152	974	$816,689		

Collision No. 30, killing 32 persons and injuring 75, was caused by the mistake of a telegraph operator. Westbound passenger train No. 29, running from A to B, C and D, etc., had orders to meet eastbound passenger train No. 30 at C and eastbound train No. 14 at B. No. 29 train arrived at B and entered a side track opposite the station, and eastbound train No. 14 proceeded on its way. While No. 29 was on the side track, the operator was called upon by the despatcher to take an order changing the meeting point with No. 30, making it B instead of C. According to his own statement, the operator, on receiving notice of this order to make a change, and while continuing to give his attention chiefly to the receiving of the message, went through the motion of striking the signal lever at his elbow so as to change it from the clear to the stop position, but

he did not make sure that the signal actually went to that position; and whatever he did or did not do to the lever, the signal was not caused to indicate stop. Before he had finished taking the message No. 29 backed out of the side track and proceeded westward along the main line past the station.

When the train passed his window the operator picked up his lantern and ran out in the attempt to stop it, though not so promptly as he otherwise would have done, because he thought that the train would stop for water a short distance west of the station, as was often or usually done. In giving the stop signal he swung his lantern so violently that the flame was soon extinguished. He then ran to the pump house near by and picked up the pumpman's lantern and tried to use it, but that also went out. He then ran back to the office and found that his signal was not in the stop position. The operator then decamped, first telling the despatcher that he felt certain that a collision would occur, and that he was afraid of being mobbed. Train No. 29 went on, and a short distance west of the station collided with No. 30. The operator subsequently came back, or was brought back, and made a statement to the county attorney.

According to the rules the despatcher should not issue an order, as, for example, to a westbound train at B, requiring it to wait at B for an eastbound train of the same class, if avoidable. When unavoidable, an order may be thus issued if the superior train (the westbound) has already stopped or is scheduled to stop at that station, or has received a previous order to stop there; and provided the weather is clear and the line is sufficiently straight and level to give an approaching engineman ample time to bring his train to a stop before reaching the signal; and provided further, that in case of a passenger train two torpedoes have been placed on the rail by the operator. As No. 29 was already stopped at B, the despatcher is held by the superintendent blameless so far as this rule is concerned, though the operator, knowing the rule, should either have put down the torpedoes or else have called the conductor into the office before finally accepting the order. The operator had been in the service of the company only five days and at this station only two days (nights). He was 18 years of age, though in applying to the company for employment (and also to another company at the same time) he gave his age as 23 and averred that he had had several years' experience, when, in fact, he had worked as an operator only 18 months. The report says that his size and general appearance indicated a man much older than 18. The collision occurred about 4.25 a.m., and the operator had been on duty about 10 hours. He stated that he had been awake all night, and there is no evidence of anything like intoxication.

Collision No. 31, occurring about 2.14 a.m., killing nine persons and injuring eight, was between an eastbound passenger train and a westbound freight, the freight being at the time partly in a side track, which it was entering. The passenger train ran past a block signal set against it at F, and the collision occurred a few rods east of the signal. The passenger train was running at high speed, although there was a dense fog at the time which made it impossible to see the signal light more than a few hundred feet; and the signal which was disregarded was on a post 40 ft. high and 25 ft. to the left of the track. The engineman chargeable with this neglect was a man of experience and his record was one of the best on the road. He asserted that the block signal indicated clear and that his speed was low—about 25 or 30 miles an hour; but these statements are both disproved by conclusive evidence to the contrary. The men in charge of the freight train are also held blameworthy in connection with this collision, as, notwithstanding the protection afforded to their movement by the block signal at F, the rule required that freights should in all cases be clear of the main track five minutes before the time for the arrival of any passenger train.

Collision No. 6, occurring about 2 a.m., was due to the engineman of a freight train misreading a despatcher's order. He was running in the inferior direction and received an order making his train superior from A to C. Subsequently he received another order modifying this. This second order contained instructions concerning five meeting or waiting points and mentioned two trains besides his own. It contained four complete sentences. The engineman, in reading, ran the second and third sentences together and wrongfully assumed that two superior trains were to wait for him at a certain station, when the order in fact named only one of those trains as being required thus to wait. This second order was not delivered to the conductor of the train. It was on Form 19, not requiring signatures, and was delivered by the operator to a man on the engine of the train as it slowly passed his station, but it was not delivered to the conductor, who was on the rear end of the train, because neither the conductor nor the rear brakeman was in position on the step of the caboose to receive the order as the station was passed. The engineman, though having received his copy of the order, should not have continued on his journey beyond that station without a hand signal from the conductor to proceed. This he did not receive, the conductor and rear brakeman having ignored the stop signal.

Collision No. 9 was due to the error of a despatcher in sending an order to the wrong train. He sent the order to station A and to station D, giving an extra westbound train right over the first and second sections of an eastbound regular train from A to D, but in sending the order to D he addressed it to the conductor and engineman of the second and third sections of the regular train. The first section had already left D and the despatcher was aware of the fact. He seems to have assumed that the address of the order as sent to D corresponded with the statement in the body of the order, when in fact it did not correspond. The station operator who received the order at D did not discover the discrepancy, nor was it noticed by the operator at A.

Collision No. 17, occurring in the middle of the night, took place on a line worked by manual block signals, communication from cabin to cabin being by bell code. The signalman at A, 45 years old, and in the service of this company eight months as signalman (and formerly as brakeman), appears to have given a clear signal to the second train when he was not certain of the information he had received from station B. He claims to have received "four bells," meaning "block clear," but the signalman at B claims that he sent five bells, meaning block not clear. The signalman at A appears to have been in doubt concerning the bell signal and yet he did not ask B to repeat it. Both signalmen are reported as of good habits and good records. A large part of the damage incident to this accident was caused by a fire which was started by coals from the firebox of the locomotive.

Collision No. 19 was due to negligence on the part of both the conductor and the engineman of a passenger train. They had received an order to wait at S until 8.45 a.m., but passed that station at about 8.38, although the order had been given to them only about 13 minutes before. The conductor entirely forgot the order and he was dismissed. The engineman had misread the order and thought that he had a right to go to another station farther on. As he was passing S the fireman looked at his watch and spoke to the engineman; but the engineman, in response to this, simply pulled the order out of his pocket and handed it to the fireman without looking at it, evidently having no doubt that his reading of the order had been correct. Before the fireman had time to finish reading the order the collision occurred. Both the conductor and engineman were men of long experience. They had been on duty about three hours.

Collision No. 22 was due to the inefficiency of the flagman of a passenger train. This flagman, 24 years of age, who had been in the service about three months, started out to flag the following train, but took neither torpedoes nor fusees. After going a short distance he returned to his train to get his overcoat, and before he could again go out a sufficient distance for his signal to be of any use the following train was upon him.

Collision No. 23, between a fast first class train and a switching freight, was due to the carelessness of a brakeman of the freight train, who turned the switch from the main track to a siding without heeding the indication of the electric visual signal, which would have warned him that the fast train was approaching. The line at this point is equipped with automatic track-circuit block signals, and the fast train had already passed the point at which it set the switch indicator when the switch was turned. This train occupied only about 1 minute and 36 seconds in running from the signal at the entrance of the block section to the misplaced switch, and when it came on, at full speed, the freight had just fouled the main track. The brakeman at fault had been in the service of the road about 14 months. The enginemen had told him particularly to look at the indicator before turning the switch. It is possible that he looked at the indicator, but allowed considerable time to elapse after looking before turning the switch, the fast train meantime passing the block signal showing clear. Another collision in this quarter (No. 2 in the table) was due to the neglect of a trainman to make proper use of an automatic indicator at a switch.

Collision No. 25 was due to inefficient management of brakes. The freight train, westbound, running slowly along a passing track while waiting for a passenger train moving in the same direction, was allowed to run a few feet too far at the end of the passing track and so fouled the main line. The passenger train, coming along just at that moment at full speed, struck the freight, and the passenger engine was overturned. The freight train consisted of 23 cars, but had air-brakes in use on only four cars. The engineman asserted that he was ignorant of the fact that the other 19 cars had been disconnected. At a station about four miles back a non-air car had been put in the fore part of the train with the view of saving time at the next station, where that car was to be left. One of the brakemen claimed to have informed the engineman about the change in braking power.

Collision No. 29 was due to a freight train becoming uncontrollable on a steep grade about 2 a.m. The men in charge of the train were experienced, but appear to have exercised poor judgment. It is believed, though not proved, that an angle cock had been shut at the third car from the engine, so that the air-brakes were not effective on that part of the train behind the third car, and

for this misplacement of the cock the conductor and engineman are held responsible. Aside from this, however, these men had allowed the train to attain too high speed before taking action to check the speed, and, in addition to this, the brakeman at the rear of the train, who should have opened the conductor's brake valve when the engineman sounded the alarm whistle, neglected to do so.

Collision No. 33 was due to a misplaced switch and occurred about 9 p.m. A northbound passenger train, running at full speed, entered a siding and struck a southbound freight train which was standing there. Both engines were demolished and from their fireboxes the wreck took fire, three Pullman cars and 11 freight cars being completely destroyed. The switch had been left wrong by an employee of another road, the side track being used in common by the two roads as a connecting track.

Derailment No. 1, killing 19 persons and injuring 149, is reported as "cause unknown," the railroad company stating that its investigation into the circumstances of the accident has not yet been completed. The train derailed consisted of five passenger cars, drawn by two electric motors. It was running at full speed on a curve of 3 deg., the outer rail of which was superelevated 4½ in. Two cars were overturned. The track consisted of rails weighing 100 lbs. to the yard, laid on 21 ties to each 33 ft., with tie plates. The ballast was stone and the whole track was well built and maintained. In the cab of the leading motor were four men, the engineman, his helper, an electrical inspector, and the assistant superintendent of the division. These men estimate the speed of the train at the time of the derailment at 45 to 50 miles an hour, which estimate is corroborated by the record at the last block signal station, compared with that at the power house, where note of the time was made when power was automatically shut off by the breaking of the third-rail electrical conductor at the moment when the cars jumped the track. The report of the railroad company further says that in making a test run some time after the accident, with a train made up like that which was wrecked and with all conditions similar, the speed proved to be 48 miles an hour at the point of the accident. A careful examination was made of the track and wreckage immediately after the derailment, but although indentations were found on wheels and rails, it was impossible to determine whether these marks had anything to do with the cause of the derailment, or were only effects.

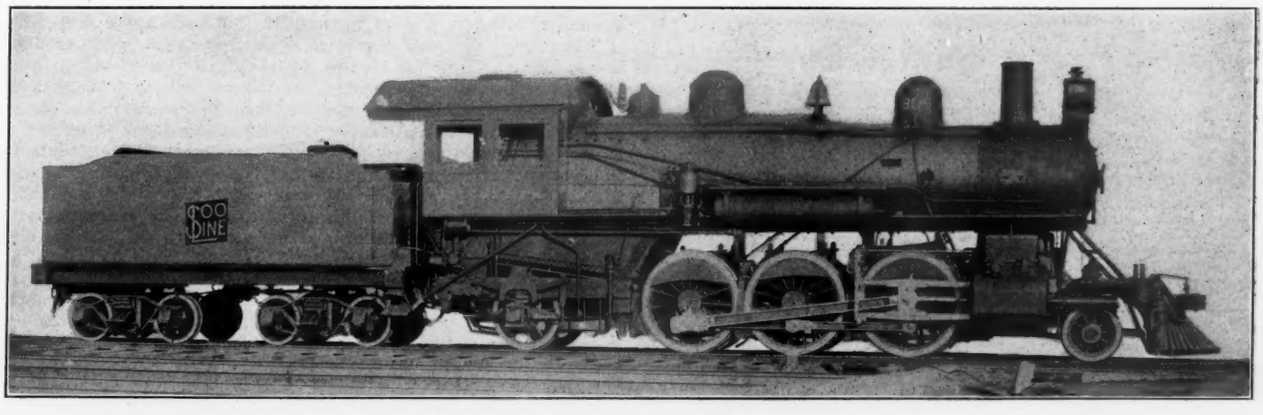
Derailment No. 18 appears to have resulted from gross negligence on the part of a number of different persons. A passenger train approaching an important station at high speed was derailed at a misplaced switch. The train was run not only in disregard of a rule requiring trains to be run within the yard limits with speed under control, but also apparently with recklessness as regards the switch which was misplaced and which caused the derailment; for it appears that the air-brakes on the train which, according to all the available evidence, were in good order, had not been applied before the engine ran off the track. The engineman was fatally injured, dying 11 days after the accident, and he made no intelligible statement. The train consisted of an engine and 14 cars. Six of these cars were completely broken up, and three others were badly wrecked. Most of the passengers who were killed were riding in two ordinary cars, not vestibuled, which were the first two cars in the train, while the cars behind these were not only heavier but were, most of them, vestibuled. The train, running at from 50 to 65 miles an hour, ran over the misplaced switch and entered the side track at such high speed that the engine was overturned at a point a few feet beyond the point where it left the main track. This switch was 1,585 ft. within the yard limit. There was a good view of the switch from the approaching train. The engineman of the passenger train was an experienced employee of this road, but the men in charge of the switching engine, who had left the switch set in the wrong position and unattended, were comparatively new to their work. The foreman of the crew had been employed at this point only four weeks, though he had had railroad experience before. The switchman who was immediately responsible had worked in this yard about six weeks, but had had several years' experience in railroad work. The engineman and fireman of the switching engine had worked in this yard only three days.

Derailment No. 9, occurring about 4 a.m. and causing the death of four passengers and of the engineman and fireman, happened at a misplaced facing-point switch, the speed of the train at the time being about 35 miles an hour. The switch was found locked in position for the side track. It had been used by a freight train about 40 minutes before, but the question who was blameworthy for the misplacement has not been settled. The switch had no lamp, being a new one. The lamp had been received for it, and it was to have been put in position the next day. The engine was equipped with an electric headlight, by the aid of which the engineman could undoubtedly have seen the position of the switch target in season to stop the train before reaching the switch; but from the position in which the dead body of the engineman was found after the derailment it is concluded that he was not keeping a good lookout. There is evidence that he had crouched down behind the boiler head to light a cigar.

Explosion.—One of the most serious train accidents occurring in the quarter under review was due to an explosion. It is not classed either as a collision or a derailment, and therefore does not appear in Table 2*a*. In this accident 14 passengers and two other persons were killed and 33 passengers and six other persons were injured. The victims were on a passenger train approaching a small station, at low speed, and the deaths and injuries were due to an explosion of powder in a car of a freight train standing on a side track. The explosion, from some cause unknown, occurred just at the moment that the express car of the passenger train passed the powder car. The passenger cars were wrecked and the total amount of damage to the cars and locomotive was $11,300. The freight car in question contained 500 kegs of powder. It was stationary at the time and had been so for at least 12 minutes. There had been heavy continuous rains for several hours previous. The car containing the powder was comparatively new. After an exhaustive investigation by officers of the road the cause of the explosion still remained a mystery.

Prairie Locomotive for the Minneapolis, St. Paul & Sault Ste. Marie.

The American Locomotive Company has recently built 10 two-cylinder compound prairie (2-6-2) locomotives for the Minneapolis, St. Paul & Sault Ste. Marie. For a number of years the two-cylinder cross compound locomotive has been successfully used in both freight and passenger service on this road; but, heretofore, the fast freight work has been done by moguls. These are the first prairie engines that have been put in service. The reason for this change was that as it was desired to use them for both freight and passenger work, the prairie, with its wide firebox, offered a better opportunity to get a large grate and the necessary ample steaming capacity for passenger service, than the mogul.



Prairie Locomotive Built by the American Locomotive Company for the Minneapolis, St. Paul & Sault Ste. Marie.

In working order the engines have a total weight of 191,500 lbs., of which 133,000 lbs., or 69½ per cent., is carried on the driving wheels. The engines are compounded on the Schenectady principle, the high-pressure cylinders being 22½ in. in diameter by 26 in. in stroke and the low-pressure 35 in. in diameter by the same stroke. This gives a cylinder ratio of 2.42. The high-pressure cylinder is equipped with a piston valve and the low-pressure with an

Allen-Richardson slide valve, the valves being actuated by the Stephenson link motion.

The boiler is of the extended wagon top type with sloping back head and throat sheet, and is made in three courses, the outside diameter of the first and smallest ring being 60¼ in. The tubes, of which there are 266, are 2 in. in diameter and 15 ft. long, which gives a heating surface of 2,077 sq. ft., the total heating surface of the boiler being 2,243 sq. ft.

These locomotives, like so many others, show the wide variation in practice in the location of the injector check. The photograph shows that it is set well to the front. As a matter of fact, its center line is just 10 in. from the inside face of the front tube-sheet. As the hole is 2½ in. in diameter the edge of the stream of entering water is only 8¾ in. from the plate. This is quite contrary to the practice on other roads. A comparative determination of effects of different locations on tubes and steaming capacity would be interesting. The firebox is 90 in. long and 62¼ in. wide, giving a grate area of 39 sq. ft. The water spaces are large, being 5 in. wide at the mud-ring and increased to 7 in. at the crown-sheet at the sides and to 6 in. at the back end.

There is here a further variation in practice in the use of flexible stays. By comparing this boiler with others that have been made recently by the same company it will be found that one boiler with a length of 108 in., had a double row of flexible stays up each side and across the top, with clusters in the upper corners. The fireboxes in these prairie engines have a grate length of 90 in. and a length at the door of about 103 in. Yet here no flexible bolts are used at all. It is quite true that this corresponds with older practice, but the question arises why one firebox should need four vertical and two horizontal rows of these bolts and another, only 5 in. shorter, should need none at all. It does not seem that the difference can be wholly either in the difference in the length or the degree of forcing to which the fire is subjected. Possibly the matter is worthy a more thorough investigation than it has yet received. The frames are of cast-steel with double front rails and a separate slabbed section at the rear for the trailing trucks.

In the matter of weight equalization a departure has been made from the ordinary practice in equalizing the front and main driving wheels with the front truck and the rear drivers with the trailing truck, instead of equalizing the two rear drivers and the trailing truck together as is usual in this type.

The following are some of the principal dimensions and ratios of these engines:

Cylinders, diameter h. p.	22½ in.
Cylinder, diameter l. p.	35 "
Piston, stroke	26 "
Wheel base, driving	11 ft. 4 "
" " total engine	29 " 3 "
" " engine and tender	56 " 6½ "
Weight in working order, drivers	133,000 lbs.
" " " total engine	191,500 "
" " " engine and tender	309,100 "
Heating surface, tubes	2,077.6 sq. ft.
" " firebox	165.9 "
" " total	2,243.5 "
Grate area	38.9 "
Journals, main driving	9½ in. x 12 in.
" trailing driving	9 " x 12 "
" front truck	6 " x 12 "
" trailing truck	8 " x 14 "
" tender	5½ " x 10 "
Steam pressure	200 lbs.
Firebox, length	90⅛ in.
" width	62½ "
" thickness crown, side and back sheets	⅜ in.
" tubesheet	½-in.
" water space	5 in.
Tubes, number	266
" diameter	2 in.
" length	15 ft.
" thickness	No. 11
Exhaust nozzle	5 in. and 5¼ in.
Stack, height above rail	14 ft. 9⅝ "
Stack, diameter	18 "
Tank capacity, water	6,000 gals.
Tank capacity, coal	10 tons
Valve, type, h. p.	Piston
" type, l. p.	Allen-Richardson
" travel	6 in.
" lap, h. p.	1¼ "
" lap, l. p.	1 "
" exhaust clearance	¼-in.
" lead	0
" lead at ½ cut-off l. p. cylinder	¼-in.
Wheels, diameter, driving	63 in.
" " front truck	33 "
" " trailing truck	46 "
" " tender	33 "
Tractive effort	26,750 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.0$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 69.45^*$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 7.2$$

$$\frac{\text{Tractive effort x diameter of drivers}}{\text{Heating surface}} = 757.0$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 57.5$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 7.3^*$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 59.3$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 85.5$$

Volume of equivalent simple cylinders = 8.99 cu. ft.

$$\frac{\text{Total heating surface}}{\text{Vol. of equivalent simple cylinders}} = 250.0$$

$$\frac{\text{Grate area}}{\text{Vol. of equivalent simple cylinders}} = 4.34$$

Tube heating surface equated to firebox heating surface (Vaughan's formula)	536.8 sq. ft.
Total equated firebox heating surface	702.7 "
Ratio of equated to actual heating surface	1 to 3.19
Ratio, volume of high to low-pressure cylinder	1 to 2.42

*Per cent.

The Maximus Brake.

The accompanying drawing shows the construction of an ingenious accessory mechanism applied to the foundation brake gear of a car to automatically produce a pressure on the brake shoe inversely proportional to the varying coefficient of friction at different speeds and thus to give a uniform retarding effect throughout the stop. The apparatus is an English invention and has been developed in connection with both the vacuum brake and the Westinghouse brake. Referring to the drawing, Fig. 1, which shows the application of the apparatus to one end of a four-wheel truck, it will be seen that the right-hand brake shoe is suspended by a rigid hanger in the ordinary manner. The left-hand shoe, however, is suspended by a link from a bell crank rigidly attached to a square shaft which extends across the end of the truck outside of the end piece. To this square shaft are also rigidly fastened two short lever arms which have pins at their ends working in circular slots in the casting bolted to the end piece and shown partly in section. This casting forms a seat for the spiral spring, the stem of which is also attached to the square shaft. The tension in this spring can be adjusted by the double nuts on the outer end of the stem. Below the spring is shown a ratchet slide which engages with a toothed pawl which is pivoted and which is normally disengaged by the pressure of the square shaft against the vertical leg. Power is transmitted from the brake cylinder through the pull rod shown at the top to the truck lever which is supported by the fixed hanger shown just to the left of the axle. This truck lever carries a roller which works in a V-shaped cam slot in the connecting yoke attached to the left-hand brake shoe and passing under the axle. The right-hand brake shoe is connected with the truck lever by a short link passing over the axle. When the brakes are applied the truck lever is pulled to the left by the pull rod in the usual way and draws the two brake shoes up tight against the circumference of the wheel. As soon as the friction is sufficiently great to cause the left-hand brake shoe, which is hung from the bell crank, to stick and begin to move down, the square shaft moves to the right against the spring pressure, pivoting about the end of the short lever arm extending downwardly. The initial tangential retarding effect at the brake shoe is thus made a constant quantity depending on the tension on the spring. At the high speeds when the coefficient of friction is low the pressure exerted by the truck lever is made correspondingly high. At the instant that the brake shoe begins to drag and to move the square shaft to the right against the spring pressure the toothed pawl is released and engages with the ratchet slide. This slide is connected back to the cylinder lever by a rod, and when it engages with the pawl all further movement of the cylinder lever and, therefore, any further increase in pressure at the brake shoe through the truck lever is arrested. In making a stop at high speed the brakes are applied with the maximum force which continues to be exerted until the tangential pull on the brake shoe releases the stop pawl and checks any further increase in braking power. As the speed falls, due to the retarding action of the brakes, the coefficient of friction increases. This causes the left-hand brake shoe to tend to drag farther and farther downward. As it moves downward the roller on the truck lever goes up in the slot of the connecting yoke and in effect opens out the toggle joint connection between the two brake shoes, thereby relieving automatically the pressure on the shoes without altering the pull at the upper end of the truck lever. If the car is moving in the opposite direction the movement of the apparatus is in the reverse direction to that described. The left-hand brake shoe moves up instead of down and the bell crank pivots about the end of the upper short lever arm. The yoke rises instead of falling and the roller on the truck lever moves downward in the cam slot, accomplishing exactly the same effect. The drawing shows the arrangement

of the apparatus at one end of the truck only. The locking mechanism, however, is applied only at the end of the truck nearest the center of the car. The brake shoes on the other pair of wheels on the truck are suspended from fixed links but are connected together with the same arrangement of toggle levers. Their action

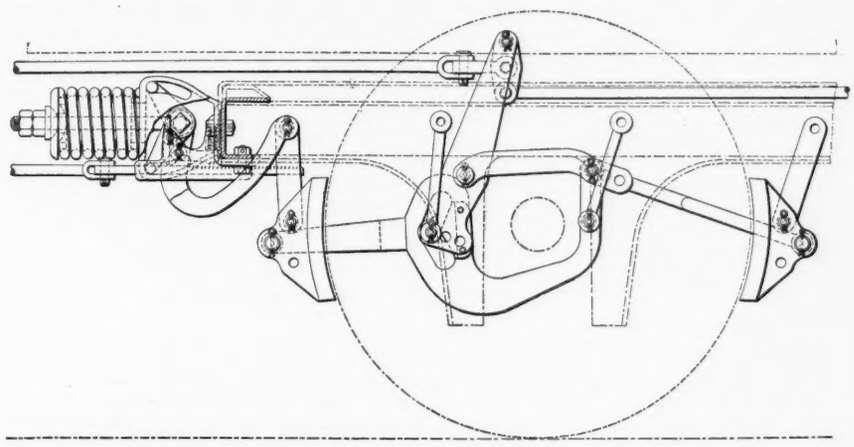


Fig. 1—Maximus Brake Apparatus Applied to Four-Wheel Truck.

under the constantly increasing coefficient of friction as the speed is reduced is precisely the same as that already described.

Figure 2 shows the apparatus as applied to a four-wheel truck on the North Eastern Railway of England. The square shaft extends across the end of the truck and the bell crank hangers with the regulating springs are mounted at each end of the truck end piece directly in line with the wheel treads. The ratchet and pawl are in the center line of the car, the connecting rod extending back to the brake cylinder levers.

The value of this apparatus is chiefly in making stops from high speed. With the ordinary brake apparatus the pressure on the brake shoe is constant, being limited to about 80 or 90 per cent. of the weight on the wheel in order to prevent skidding at the end of the stop. At very high speeds the coefficient of friction is less than one-third the coefficient of friction at low speeds and consequently an arrangement of brake apparatus employing a constant braking pressure from the beginning to the end of the stop has an efficiency when first applied of not more than 26 per cent., at medium speeds 52 per cent. and near the end of the stop 80 per cent., or an average of but little over 50 per cent. With the Maximus brake the initial braking power is increased to 160 per cent. or more of the weight of the car either by changing the foundation brake leverage or by increasing the size or pressure in the brake cylinders. This braking power is effective at the beginning of the application, but it is gradually and automatically eased off in the manner described to 80 or 90 per cent. of the load as the train comes to a stop, giving an average of about 120 per cent. as against 50 per cent. for the ordinary brake. It effects a constant and maximum retardation from the beginning of the application and is just as effective at high speeds as at low speeds.

The comparative effects of the Maximus and the ordinary brake are shown in Fig. 3, the pressures and retardation being calculated from an initial speed of 78 miles an hour. The Maximus brake quickly attains 160 per cent. brake shoe pressure which continues constant until the coefficient of friction rises to the point where the adjustment of the brakes causes the pressure to automatically ease off to 80 per cent. at the end of the stop. The ordinary brake attains the maximum pressure of 80 per cent. in about the same time and continues constant to the end of the stop. The retardation of the two brakes is also plotted on the diagram, being the product of the coefficient of friction by the per cent. of brake shoe pressure. The relative areas of the diagrams represent the relative effectiveness of the two brakes. The Maximus brake exerts 69.8 per cent. more pressure and effects 62.13 per cent. more retardation. It stops a train in 38.32 per cent. less distance.

Fig. 4 shows the results of some comparative brake tests made on the North Eastern Railway which check closely the theoretical diagram shown in Fig. 3. These tests were made on a strip of straight track between York and Pilmoor during January and February, 1906. The stops shown for the ordinary brake were made by slipping one six-wheel coach braked on the four end wheels only to 62 per cent. mathematically of its weight. The same coach was then taken into the shop and fitted with the Maximus brake apparatus with the same percentage of weight braked. The tests were then repeated under the same conditions, both tests being made on days which were clear and dry. The highest initial speed

Fig. 2—Application of Maximus Brake to North Eastern Railway Four-Wheel Truck.

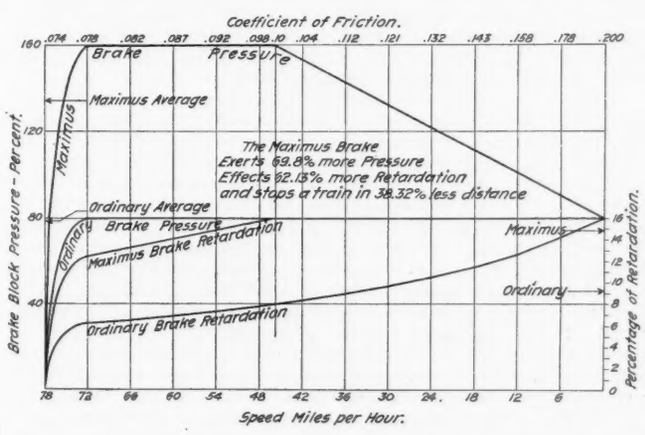


Fig. 3—Comparative Pressure and Retardation of Maximus and Ordinary Brakes.

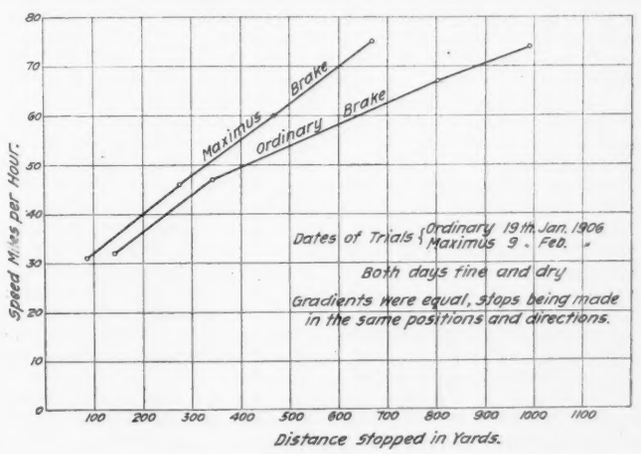


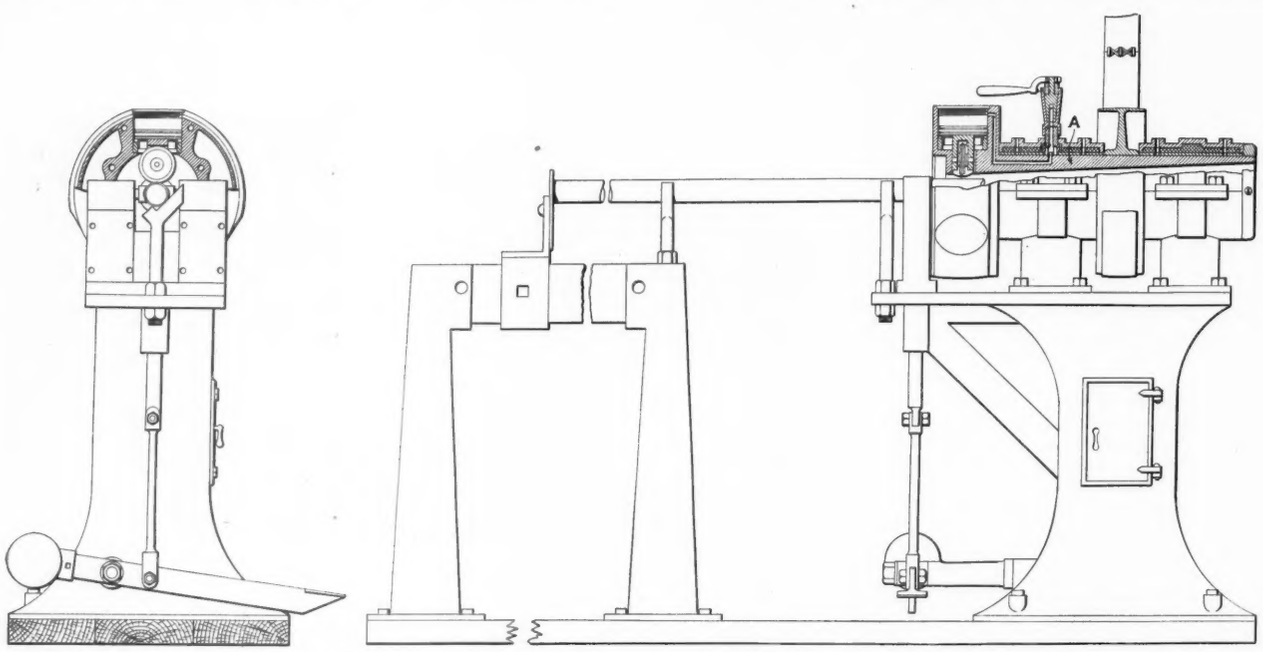
Fig. 4—Diagram of Brake Trials on the North Eastern Railway.

attained was 74 miles an hour with the ordinary brake and 75 miles an hour with the Maximus brake. With the Maximus brake the car was stopped from 75 m.p.h. in 2,010 ft. The coach, fitted with the ordinary brake, was stopped at 74 miles an hour in 2,970 ft. Equating the two steps for equivalent speeds the saving was 34 per cent. At 60 miles an hour the saving was 26.5 per cent. More recent tests have shown even greater saving in distance in making stops.

The action of the brake being entirely automatic the engineman does not need to be careful in making emergency or service applications. Full braking power can be thrown on at either high or low speed without danger of skidding the wheels or making uncomfortable stops. The action of the brake is said to be very smooth and uniform at both high speeds and low speeds. So successful have the trials been in England that the Great Western has already bought the rights to apply the apparatus to all of its passenger stock. It is controlled by the Maximus Brake Syndicate, Limited, Queen Anne's Chambers, Westminster, London. The licensees for Great Britain are Taite & Carlton, 63 Victoria street, London. Harvey E. Brown, Managing Director of the Maximus Brake Syndicate, with headquarters at the Southern Hotel, St. Louis, Mo., is introducing the device in the United States.

Pneumatic Tube and Pipe Cutter.

A pneumatic tube and pipe cutter designed by S. H. Lewis, assistant general foreman, is in use at the shops of the Seaboard Air Line at Portsmouth, Va. It can be easily operated by one man. With an air pressure of 50 lbs. per sq. in. it can cut three 2-in. locomotive tubes per minute, including the handling. If the air pressure is increased, the capacity increases also. Furthermore, the cutter is very economical in air consumption.



Pneumatic Tube and Pipe Cutter; Seaboard Air Line Shops.

The machine consists of a sleeve A turning in long bearings and driven by a pulley keyed near its center. At the end of the sleeve is an enlargement containing three cylinders to which pistons are fitted. These cylinders stand on radial lines and the pistons have roller cutters attached. There are ports through the sleeve as shown that lead to the outer end of the cylinders, through which air is admitted by means of the three-way cock. Stops for the tube and Y supports are provided beyond the end of the machine and the tube is firmly clamped in position by pressure on a pedal.

After the machine is started the tube is placed in position to be cut, resting on the supports and shoved back against the stop. It is clamped by the pedal and the handle of the three-way cock is turned to admit air to the outer ends of the cylinders. This forces the pistons in and the cutters against the tube. As the circular head revolves the cutters roll around the tube and are forced in and cut off the piece in a few revolutions.

The piece cut off passes out at the back end through the hollow tapered spindle. When the tube is cut, the air valve is moved to exhaust and the cutters open by centrifugal force to receive another tube. As the tube is clamped by the pedal it can be fixed and released instantly without loss of time, and as the tube does not revolve, the machine is practically noiseless. In addition to these advantages the boiler maker does not have to mark each tube where it is to be cut, as the length is fixed by the adjustment of the stop. This is of value in cutting new tubes into safe ends, as the work of handling the tubes is materially lessened.

The cutters are of steel ⅛ in. thick and 3 in. in diameter; they are cheap, and their life is long. One set of cutters in the Seaboard Air Line shops has been in service for four months and has made 24,000 cuts without grinding on 2-in. tubes, approximately ⅛ in. thick.

Previous to building this machine the number of engines that could be turned out of the shop was dependent on the tube work; but since its installation the amount of tube work to be done is not considered in deciding upon the number of engines to be turned out. At the present time, with an output of six engines that are receiving a general overhauling per week, and notwithstanding the fact that other facilities have been greatly increased, the one tube cutter in service is idle a large part of the time.

An American State Owned Railroad.*

Instances of government ownership and operation of railroads have been rare in America. The Western & Atlantic Railroad furnishes perhaps the most important example in our history. That road was begun under a legislative act of 1836, built with public funds, and operated by the state government during periods of prosperity and depression, of peace, war and political reconstruction until 1870, when it was finally leased to a private corporation.

In 1826, Wilson Lumpkin, afterwards Governor of Georgia, made a survey through central Georgia and the Cherokee territory to the northwestward and reported that a route could there be had for a railroad. At this time steam locomotion was hardly contemplated for railroads in America, and Lumpkin proposed that the motive power should be furnished by teams of mules.

The idea upon which Lumpkin had acted in his survey was never abandoned. The revised charter of 1835 of the Georgia Railroad recites in its preamble: "The people of the West have in contemplation to make a communication between the city of Cincinnati and the South Atlantic coast by means of a railroad, and the best route for such communication is believed to be through the state of Georgia. The building of the Georgia Railroad is now in progress and will be an important link in the line of said communication." Among the projects was one for the state of Georgia to build a large part of the desired communication as a distinctly public enterprise. The legislature which met in December, 1836, passed a law which directed the survey and construction of a railroad from a point near Rossville to some eligible point on the southeastern bank of the Chattahoochee river, and provided funds not to exceed $350,000 a year, unless a future legislature should otherwise enact. The road was named the Western & Atlantic. A year later an increased provision of funds was made by authorizing the sale of state bonds

*Abstract of an article in the *Yale Review* by Ulrich B. Phillips, of the University of Wisconsin.

in amounts not more than $500,000 in any one year. By an act of 1838 an appropriation of $1,500,000 in 30-year 6 per cent. state bonds supplemented and superseded the earlier provision.

Under the Act of 1836 the survey for the Western & Atlantic was pushed rapidly forward and by the end of 1837 specifications for the first 50 miles of the road were ready. In April the contracts for the grading of 50 miles were let and in October 50 miles more. By February, 1839, the contractors were working about 2,000 men on the road, and fair promise was given for the completion of the first 100 miles by the autumn of that year. In some sections, however, cuts and fills were exceedingly heavy, and some cuts which ran through rock formations were necessarily slow and expensive.

But financial troubles now came in a flood. The contractors on the road were informed of the state of finances, and authorized to suspend work or carry it on with the prospect of delayed payment as they should see fit. In the dearth of other opportunities for their labor in the stagnation of business, most of the contractors were disposed to complete the work on their sections, and even to secure additional contracts on the northern end of the line, and proposed to accept payment in the unsalable scrip of the state. The contracts for grading the remainder of the route were let at the end of 1839, with the one important exception of the section which was to include a tunnel a quarter of a mile long—the only tunnel on the route. The continued strain on credit, however, caused such severe decline in the market rates for state scrip, that most of the contractors, by the spring of 1842, suspended work.

The delay in the progress of the road, it happened, was not a cause of general regret. The depression of credit, each month more severe, had forced the stoppage of work on all the roads which were expected to connect with either end of the Western & Atlantic. The importance of that road lay in its becoming a connecting link of a general system. It would be of no use to forge the link until the chain was approaching readiness. Furthermore, neither of the railroads from the ocean gateways had reached within 60 miles of the beginning of the Western & Atlantic, and it would be an extravagance to haul rails and rolling stock over the wretched country roads to the isolated state railroad, which, if built, would begin on a vacant hill-top and run through ravines and forests to no terminus of consequence. The completion of the roadbed, without the laying of the superstructure, would entail a loss through the washing of the soil in the cuts and fills. The continued depression of state credit, meanwhile, made it inexpedient to attempt to buy rails.

The commission advised, in February, 1841, that the lower 52 miles of the route alone be prepared for the superstructure, and work on the northern part of the route be neglected; that as soon as one of the railroads from Macon or Augusta should reach the connecting point, the superstructure should be laid on the 52 miles and the road be put in operation for that distance; that meanwhile, the state should give financial aid to the company roads and enable them to make the Western & Atlantic connection. The state government approved most of these items and an act of December, 1841, dissolved the commission, replacing it with a disbursing agent, ordered the completion of the road for 52 miles when it should become feasible, and the suspension of work on the upper part of the route. The laying of rails for the 52 miles was in progress from 1843 to 1845; and thereafter, under an act of 1842, the road was gradually extended through the application of the net earnings from its operation. Active work was resumed under an act of 1847, and the road was completed to Chattanooga, May, 1851. Meanwhile, after 1845, times were growing much better; cotton prices rose again to satisfactory levels, business in general revived, and state scrip could be sold at par. An act of 1847 ordered the completion of the road, providing $375,000 in state bonds as the limit for the work.

The prospect for profitable traffic became much brighter. In 1845 and 1846 lines from Augusta and Savannah had reached the Western & Atlantic terminus. During 1848 the Nashville & Chattanooga Railroad was organized and put under contract. The branch from the main stem of the Western & Atlantic at Kingston was soon afterwards completed to Rome, and, aided by a steamboat on the river, attracted trade from the valley of the Coosa in Alabama. At the same time building of the Etowah flouring mills on the line of the road stimulated the production of wheat to an unprecedented extent.

With the piercing of Tunnel Hill, October 30, 1849, the completion of the road became easy. The last rails were laid in the spring of 1851. In May of that year the first train ran to Chattanooga. The road was 138 miles long and graded through much of its length for a double track, though equipped with only a single one, of 5-ft. gage. It crossed three river valleys and the dividing watersheds. Its track was a patchwork of strap rails and flange rails laid on wooden stringers, and "bridge rails," of the shape of an inverted U, spiked directly to the cross ties. Its rolling stock consisted of 13 engines, four passenger cars, two baggage cars, four box cars and six platform cars. The epoch of operation and its problems had begun.

In 1852 Governor Cobb secured as Superintendent William Wadley, who had been most successful as Superintendent of the Central of Georgia. Wadley's influence was at once felt with benefit. During the spring and summer extensive repairs were made; stations were built, the substitution of T rail for the plate rail was begun, and the rolling stock was rapidly increased. The total earnings of the road advanced from less than $200,000 in 1849-1850 and $285,000 in 1850-1851 to $375,176 in 1851-1852 and $478,876 in 1853-1854. Such part of these amounts as exceeded the expenses of operation were applied to betterments and charged to account of construction.

Wadley was succeeded in January, 1853, as Superintendent of the Western & Atlantic by George Yonge, and he in 1854 by Thomas F. Cooper. The position was later held by James M. Spullock from the summer of 1856 until the end of 1857, when the accession of Joseph E. Brown to the Governorship and his appointment of John W. Lewis brought a distinctly new régime in Western & Atlantic affairs. Until the businesslike administration of Brown and Lewis began, the commonwealth had continually felt that it had a white elephant on its hands. The people were anxious lest the road and its money should become the instrument of political tyranny and corruption, but feared, on the other hand, that a still greater power would be established for possible evil if the road were sold or leased to a private corporation. The *Federal Union* in an editorial January 31, 1854, which in its dread of corporation control has a very modern tone, spoke as follows:

> "The road has never yet had a fair trial; within the last two years large improvements have been made on some parts of it, and great additions to its equipment; several branch roads have also been built which will add greatly to the business of the main trunk; and now, just as the proudest hopes of the friends of the road are about to be realized, it is proposed to turn over this great work with all its splendid prospects to a company of speculators. But the pecuniary loss would not be all that the people would suffer by this transaction. A large corporation, like a mighty Colossus, with one foot at Savannah and the other at Chattanooga, will bestride the state, whilst its iron fingers will be felt in every election and will direct the future legislation of the state. No matter what guards and checks this legislature may throw around such a corporation, when they once get control of such immense resources they will elect a legislature to suit themselves and will break all these bands like cobwebs. We are willing to entrust the management of the road to the people, whether the Whigs or Democrats are in power, for we believe that the large majority of both parties are honst men and their agents are always responsible to the people for their conduct, but a gigantic corporation has neither soul nor conscience and owes no responsibility to any tribunal whether in heaven or on earth. The influence of corporations is already felt in every fibre of our legislation; it can be seen in every vote that is taken on this subject, and if ever these corporations get control of the State road, they will govern the state."

A vital problem was that of freight rates. Here the crux was in the question of whose interests the state road ought primarily to subserve. Ought rates to be high for the sake of large returns to the treasury, or low to benefit the citizens who were consumers of western produce? Ought local tariffs to be on the lowest basis, so as to increase the prosperity along the route of the road in Georgia, or ought the through rates to be at the minimum so as to attract business from afar and cheapen the food supply throughout the cotton belt? Ought the rates on goods for transfer to the connecting lines in Georgia to be on a reduced basis for the benefit of the established towns like Macon and Augusta, or ought the tariff to be absolutely uniform and thus promote the growth of a distributing center of food supplies for the cotton belt at the Western & Atlantic terminus? The actual policy as to freight rates was based on a few substantial principles: the road ought to yield a reasonable return on the investment; it ought to promote the welfare of the people of the state at large; it ought to subserve the special interests of the people along the route when they did not conflict with those of the state at large, but in case of such conflict the larger interest ought to prevail. These doctrines, of course, were easier to formulate than to apply in concrete cases with general satisfaction. Indeed freight rates seem to have been altered with some frequency to allay clamor.

The fact that the road was for a period incomplete and operated for strictly local business, caused the rise of local enterprises which shortly led to vigorous demands on the ground of protection to vested interests. The growing of wheat and corn along the route yielded large returns so long as the road was unfinished, but was thereafter embarrassed by the western competition. There was also phenomenal growth at the southern end of the road of a town first called Terminus, then Marthasville, and finally Atlanta. The grain raisers, of course, objected to any reduction of rates for western cereals, while Atlanta protested against any tariff which would encourage shippers to send carloads past her depot unbroken. These protests were at times of some avail. For example, in November, 1855, a rule was put in force that all down traffic on the Western & Atlantic should bear the same charges whether bound for Atlanta or points below. At the same time rates on corn were fixed on a strictly distance basis; the road was laid off into seven divisions of distance, and the rate for corn in sacks fixed at five cents a bushel for one unit of distance, six cents for two units, seven cents

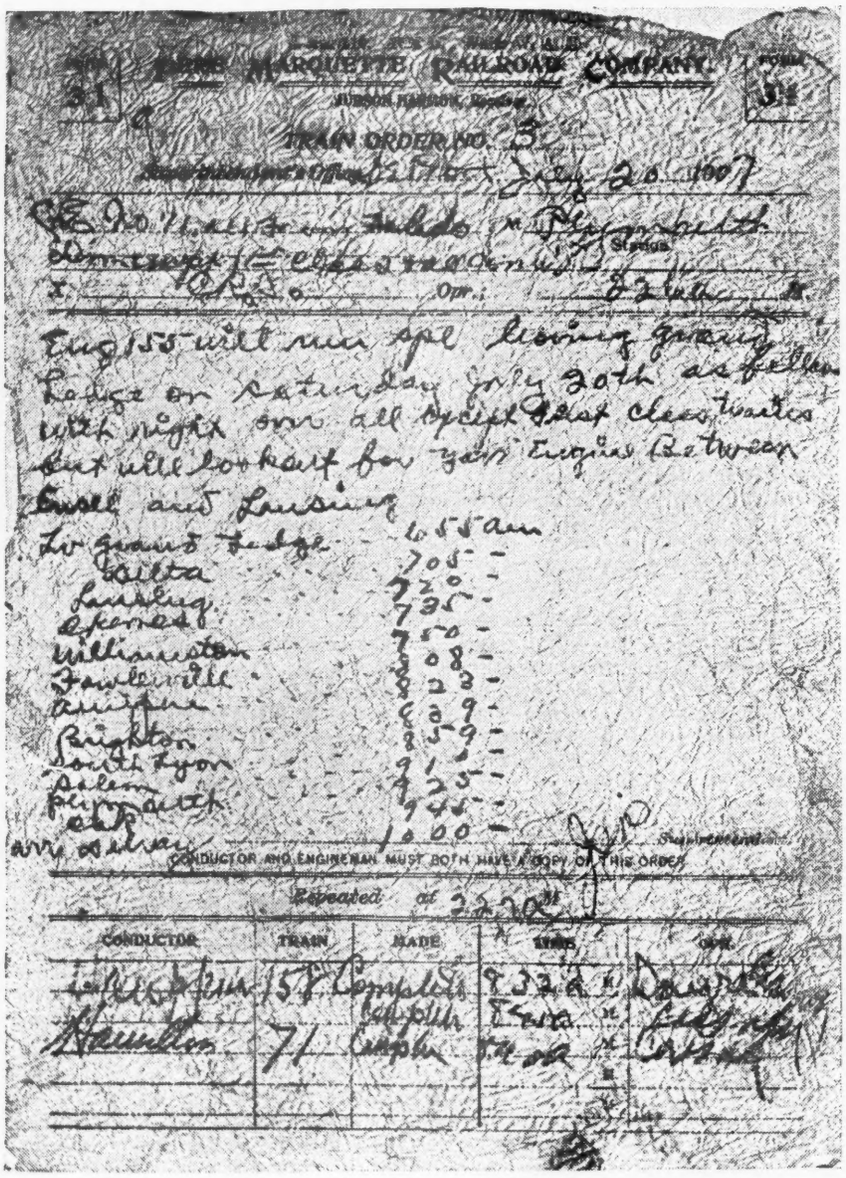
for three, and so on to 11 cents for the whole length of the road. Four cents a bushel was included in this tariff for terminal charges and one cent for carriage over each unit of distance.

The disproportion of down traffic and up traffic was enormous. No tonnage tables are available for the ante bellum period, but the figures from the report of 1868-1869 are perhaps a fair illustration of this characteristic feature of the road. In that year the through tonnage southward from Chattanooga to Atlanta was 233,022,932 lbs., and the through tonnage northward between the same stations was 6,089,500 lbs. The total freight southward was above 350,000,000 lbs., while the total northward was below 30,000,000. This meant that 11 cars out of every 12 had to go back empty, and the profit on the downward load was diminished in all such cases by the cost of hauling back the empty car.

From 1861 to 1863, there is to be noted the heavy traffic on government account, the large nominal earnings in depreciated currency, and a great deterioration of track and rolling stock. In 1864, Sherman's army destroyed much of the track and equipment, a destruction which was crudely restored, in part only, by the Confederate government and the state before the end of the war. The road was operated by the United States military authorities and was restored to the commonwealth on September 25, 1865, a rough patchwork of damaged and crooked rails, laid on rotten crossties and on rough poles and other makeshifts; eight miles of track at the upper end were entirely missing, while the rolling stock was fit for the scrap heap. In 1866-1867 there followed a period of vigorous rehabilitation; there was an immense press of traffic to supply the exhausted country, a pressure increased by delay in reopening the seaboard lines; the gross earnings for 1865-1866 were $1,315,756.40, and for 1866-1867 $1,273,191.35; net, $360,655.69 and $585,729.13; large sums were devoted to rebuilding.

In 1870 there ensued a travesty of administration with wholesale mismanagement, extravagance and plundering, shared in by numerous politicians. Blodgett, the Superintendent, is said to have stated, with grim humor, that he took charge of the road to manage its "public and political policy." N. P. Hotchkiss, the Auditor, when asked how he had managed to save up 20 or 30 thousand dollars in a year or two out of a $2,000 salary, explained that it had been done "by the exercise of the most rigid economy." Blodgett and others were afterwards indicted for various crimes, but were pardoned by Conley, the last Republican Governor. By the autumn of 1870, the officials of connecting lines began to protest against the Western & Atlantic track as too dangerous to trust their cars on. Blodgett was robbing the road of all it was earning and of all he could borrow in its name, and now demanded an appropriation of $500,000 from the State for repairs. The condition of things had now become intolerable for the people, and a great cry arose for the road to be taken out of politics.

At the meeting of the legislature in October, 1870, a law was passed providing for the lease of the road, on adequate security, for 20 years, at not less than $25,000 a month. A company headed by ex-Governor Joseph E. Brown at its head, and including railroad presidents and politicians, Democrats and Carpet-Baggers, made a bid of $25,000 a month, furnished acceptable security and received the award of the lease. At the end of 1870 the Western & Atlantic accordingly passed out of state operation. When the term of the lease expired in 1890, a new lease, which now has some years yet to run, was made of the state road to the Nashville, Chattanooga & St. Louis at $420,000 a year. The existing status of the road as public property under private operation continues to be viewed in the state with general satisfaction.



Schedule of Special Train Wrecked at Salem, Michigan.

The Salem Train Order.

We print herewith a fac-simile, slightly reduced, of the train order which figured in the disastrous collision at Salem, Mich., July 20, made from a plate for which we are indebted to the *Detroit News*. This copy of the order was made at Plymouth by the night operator, and the copy for the freight train (Train No. 71) was delivered by the day operator about 8.40 a.m. Further particulars are given in the editorial on page 114.

Earnings of German Roads.

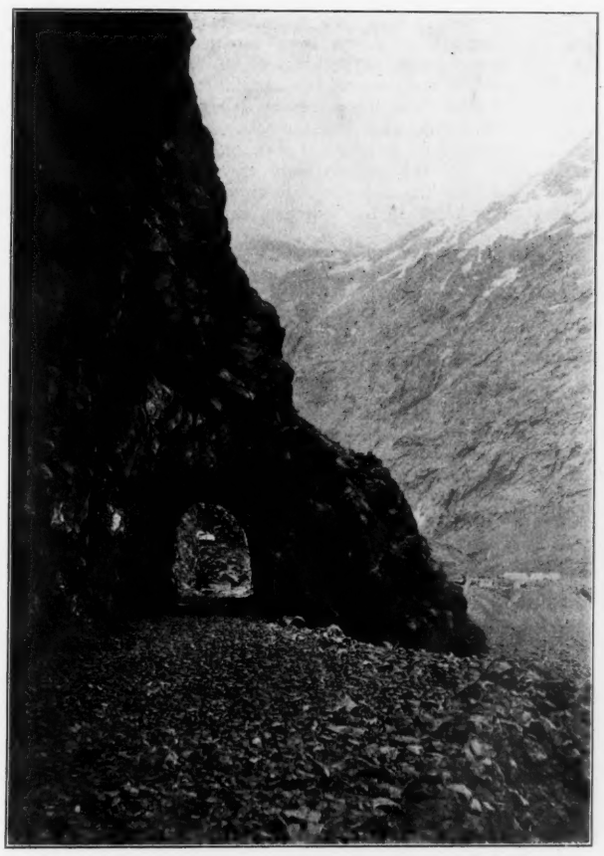
At the beginning of the year 1906 there were 34,124 miles of standard gage railroads in Germany, 21 per cent. more than there were 10 years ago. The area of the German Empire is 208,780 square miles and the population is 62,125,000. The receipts from passenger traffic for the year 1905 were $163,773,750, 63 per cent. more than in 1895. The passenger and baggage traffic contributed 28 per cent. to the total receipts. There are four class rates for passengers. The first class averaged but 4 per cent. of the passenger traffic; second class, 21 per cent., and third and fourth class, 75 per cent. The average earnings per passenger per kilometer (0.62 miles) was about six-tenths of a cent, 12 per cent. less than in 1895. Freight earnings were $376,585,020, an increase of 57 per cent. over 1895. The receipts per ton per kilometer were about 8 cents. Ninety-two per cent. of the standard gage road is owned and operated by the governments of either the confederacy or the separate states; the balance is owned by private joint-stock companies. The net income on the capital invested in all the roads averaged 6.4 per cent. a year. There were 606,612 employees and officials in the service in 1905. Salaries, wages, etc., including $12,278,420 devoted to institutions and other expenses for their benefit, amounted to $209,618,500, an increase of 17 per cent. over the expenditure per person in 1895.

The Trans-Andine Railroads.

BY LEWIS R. FREEMAN.

The present year has been marked by two events which are important in the history of South American railroads. The first was the completion of the Chilean Trans-Andine, after many years of construction in the face of heavy difficulties, to a point where, at an elevation of 10,500 ft., nothing intervenes between it and the Argentine Trans-Andine Railroad but a mile of granite mountain through which a tunnel is being driven as fast as possible. The other event was the discovery, 300 miles south of the Transandine route, of a pass through the Andes whose highest point is at an elevation of only 2,200 ft., and so open that a broad gage line can be run through from the coast of Chile to Bahia Blanca and Buenos Aires without building a single tunnel.

The west coast of South America, as far as freight, mail and passenger services are concerned, is as remote from New York and London as Australia, and twice as remote as South Africa. The people of Chile, Peru and Ecuador, when voyaging to Europe, sail down the coast, around Cape Horn and then north again to Buenos Aires or Montevideo, where a direct European connection is made. The time required is from five to eight weeks, and the expense



Grading for the Chilean Trans-Andine.

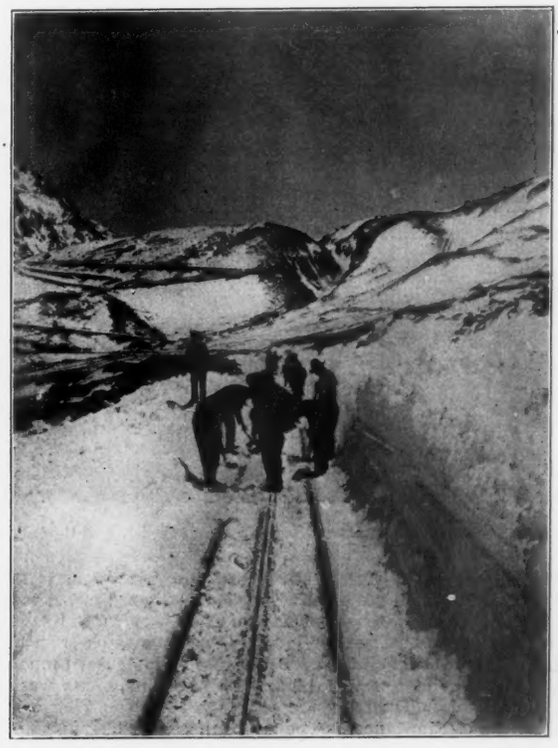
is almost as much as making a direct first-class trip around the world following the usual northern hemisphere routes. The much shorter Panama route is no less expensive and, owing to the slow and irregular coasting steamer service, usually takes as much or more time than the all-water route by the Horn.

Mail to Peru and Ecuador usually comes by Panama, but the great bulk of the freight to these countries as well as Chile, pays the high insurance covering the passage by the Horn rather than meet the expense of the double trans-shipment at Panama and the delays to freight by that route on account of the overcrowded condition of the Isthmian railroad. For the people of Chile, and for many Peruvians, the completion of the first transcontinental railroad will cut down the expense of the European voyage 30 per cent., and save in time of transit of both passengers and mail almost 50 per cent.

Chile will obtain favorable freight rates over the broad-gage line building by the newly discovered low-grade pass of San Martin, which is now breaking all South American records for rapid construction. Trans-shipment of goods to train will be made at Buenos Aires, La Plata or Bahia Blanca, from where they may be carried to destination without further transfer. The cost of trans-shipment will be more than met by the saving in insurance. There will be avoided the passage of the tempestuous Horn, and also, for six months of the year, the even greater danger of exposure in the unprotected Chilean harbors to the "northers," storms of great violence which occur on the southern Pacific coast during the winter season. A second handling at Chilean ports would probably prove too costly to warrant shipping freight to Ecuador and Peru across the continent by rail, and relief for those countries will be deferred until the completion of the Panama Canal.

The historic Uspallata Pass, on the line of the Trans-Andine Railroad, has formed the principal land route of travel between the Pacific and Atlantic coasts of South America ever since the Spanish conquerors of Peru first crossed by it when descending into Chile to found the present cities of Santiago and Valparaiso. The highway discovered and opened up by these early "makers of empires" was the same one over which the Argentine patriot, San Martin, poured the troops that struck the death-blow to Spanish power in South America at Chacabuco. The population center of the southeastern part of the continent is in the vicinity of the Rio Plate where the three cities of Buenos Aires, Rosario and Montevideo contain between them nearly 2,000,000 inhabitants. On the west coast Valparaiso and Santiago are in almost the same latitude as the mouth of the Plate, and a line drawn between these two centers cuts the Andes almost exactly at Uspallata Pass.

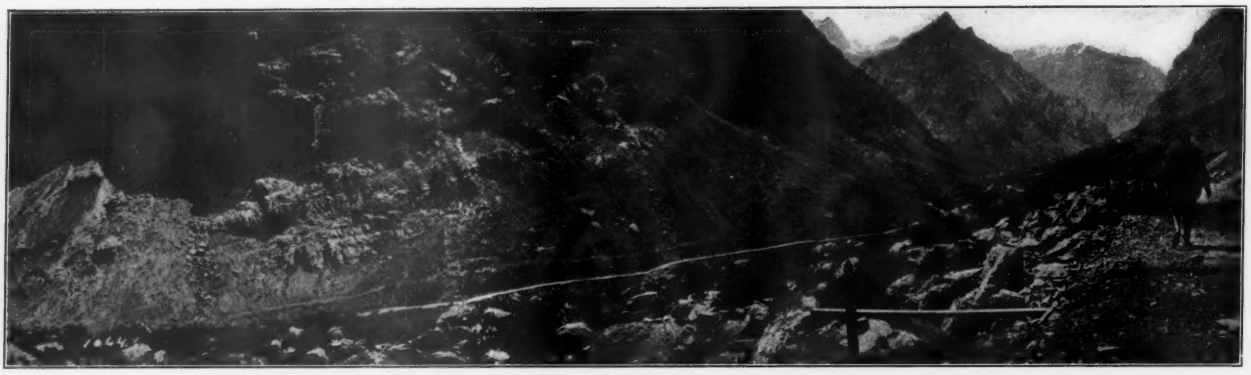
Long before a railroad over the mountains was considered feasible 700 miles of direct line was built across the Argentine pampa to the rich and populous wine-growing province of Mendoza, at the foot of the Andes and on the line of the old approach to Uspallata pass. On the Chilean side the extension of the government road up the fertile valley of the Rio Aconcagua to Los Andes penetrated for some distance the outer ranges of the mountains and approached even nearer than the Argentine road to the summit of the divide. The terminals of these two roads were only about 60 miles apart in an air line and, when the Trans-Andine Railroad was proposed, a survey showed that they could be connected by rail with something like 110 miles of track.



Clearing Snow on Rack Section of Argentine Trans-Andine.

The 70 miles of the Argentine section of this line—from Mendoza to Las Cuevas, where the summit tunnel is now being driven—follows the open valley of the Rio Mendoza for nearly all of its length and involves no difficult construction. It was completed several years ago and has been in operation ever since, doing a good business in the summer months in carrying mail, passengers and light freight. On the Chilean side, however, where only 40 miles had to be built, the physical obstacles to be overcome in building a line that would be protected at all exposed points from the snow-slides that every spring sweep down the steep slopes of the Andes, have made progress so slow that only this spring have the rails been laid up to the portal of the summit tunnel.

The last 13 miles of the Chilean section presented to the engineers the most difficult problems. The snow that causes all the



Approach to Uspallata Pass on the Chilean Side, Showing Railroad Grade on the Right and Government Wagon Road on the Left.

trouble in winter is partly the result of natural precipitation and partly the result of slides from the slopes of the 20,000-ft. mountains that hem in the pass. This snow is from 10 to 60 ft. deep by spring time, and when an accumulation of seven months begins to slide in the thaws of November and December, whole faces of the mountains often break away. The coach road running up to the pass is rebuilt each spring at an expense of $60,000 by the Chilean government. During the summer it is one of the best mountain highways to be found in any part of the world, but it is so completely ground down and scoured out by the slides that its reconstruction involves both regrading and resurveying.

The engineers who built this section of the railroad had to conform to the limiting grades, and also protect the track from the boundary line between Chile and Argentina cuts the tunnel almost in the middle, 3,000 ft. below the base of the colossal statue of Christ, which, as shown in one of the photographs, crowns the summit of Uspallata Pass. Work has been in progress for 18 months and about half a mile has been driven from each end. Little headway was made at first because all the native laborers were inexperienced in the use of the special machinery employed, but from the present rate of progress it is expected that the headings will meet some time in the latter part of 1908.

Up to this time passengers and light mail and baggage have been carried over the pass by stage three times a week during five or six months of the summer, the time from Buenos Aires to Valparaiso being from 40 to 60 hours, depending largely on whether

The International Boundary Line Between Chile and Argentina at the Summit of Uspallata Pass.

onslaughts of the spring slides and the winter snow to permit operation all the year round. The heaviest snow-sheds of the North American transcontinental railroads would be about as useful here as canvas wind shields in preventing the track from being carried off down the mountain. The method adopted of tunneling deep into the sides of the mountains at all exposed points was a heroic measure, but undoubtedly the only one that would have succeeded under the circumstances. The last 13 miles leading up to the divide is broken by 15 tunnels, all through the solid rock, and some of them over a quarter of a mile long.

The summit tunnel, which is being driven at an altitude of 10,500 ft., will be a little over two miles long. It is the longest tunnel ever attempted at so great a height. The international snow was falling on the summit. Though the schedule calls for the trip over the pass between Los Andes and Mendoza between daylight and dark of the same day it usually happens that delays force the passenger to spend a night in one of a group of stone huts at Las Cuevas, near the summit. With the completion of the tunnel, trains will be run from coast to coast on a 30-hour schedule every day of the year. At the present time the boats carrying mail to and from the west coast leave Valparaiso every two weeks and take about two weeks in the passage to Montevideo, so that mail or passengers missing a boat must wait 13 days, or a total of 27 days, before reaching the east coast. The railroad will save from 12 to 26 days in either direction for mail and passengers.

This Uspallata line, however, cannot hope ever to do an ex-

The Argentine Trans-Andine Railroad Approaching Uspallata Pass.

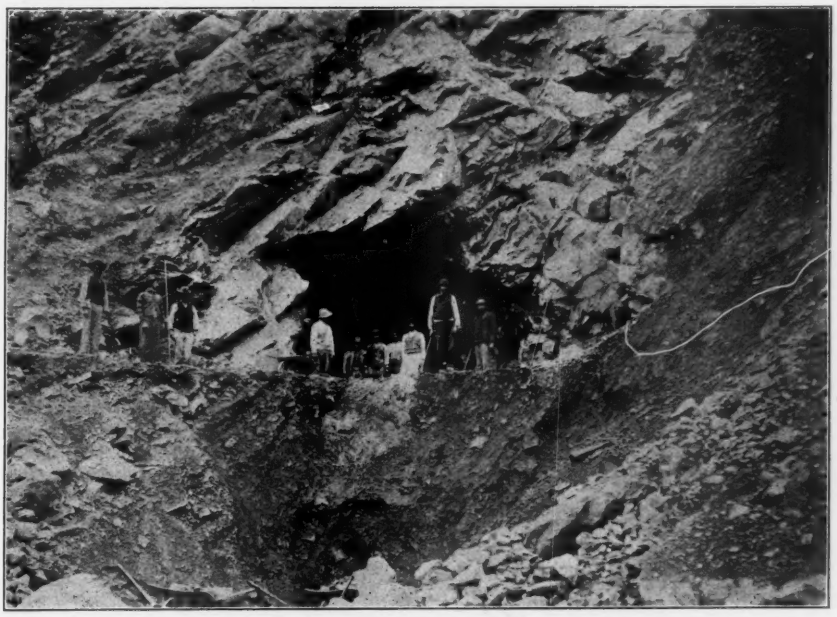
tensive freight business because of the heavy grades, some of which, where the rack system is employed, run as high as 8 per cent. This together with the high price of coal in that part of South America will make the carrying of anything but light packages too expensive to permit competition with the steamship lines. For this reason the recent discovery of a favorable location for a broad-gage line through the hitherto practically unknown southern pass of San Martin is most important.

The pass of San Martin lies in a region until lately unexplored. Because of the determined stand made by the warlike Arauco Indians, the early Spanish conquerors of Chile were never able to extend their influence beyond the broad river Bio-Bio, which, at about the 38th parallel, cuts transversely across the country from the Andes to the coast. These Indians long ago became peaceful agriculturists, but Chileans still refer to the Bio-Bio as the "frontier," and though the extension of the government railroad to the south has done much to encourage settlement, the country is still wild and forbidding.

The announcement of the discovery of an open pass through the Andes at an extreme altitude of 2,300 ft. was received with incredulity in all parts of South America. The Oroya Railroad in Peru, which penetrates only the first range of the Peruvian Andes, had to climb to an elevation of 18,000 ft.; the railroad to Quito, the Ecuadoran capital, from Guayaquil, its port, ascends to more than 13,000 ft. In Colombia, the capital, Bogotá, while a short day's journey to the Pacific coast if a railroad could be built to scale the lowest of the lofty passes that exist in that region, on account of the difficulty of building such a road, still has to depend on the tedious two weeks' trip to the Carribean down the Magdalena river. From one end of the continent to the other, from the 22,000-ft. Chimborazi in the north to the 23,500-ft. Aconcagua in the south, is a continuous chain of great peaks 20,000 ft. above the sea. The famous Pass of Uspallata has always been considered the most favorable for travel on account of its comparatively low altitude of 13,000 ft.

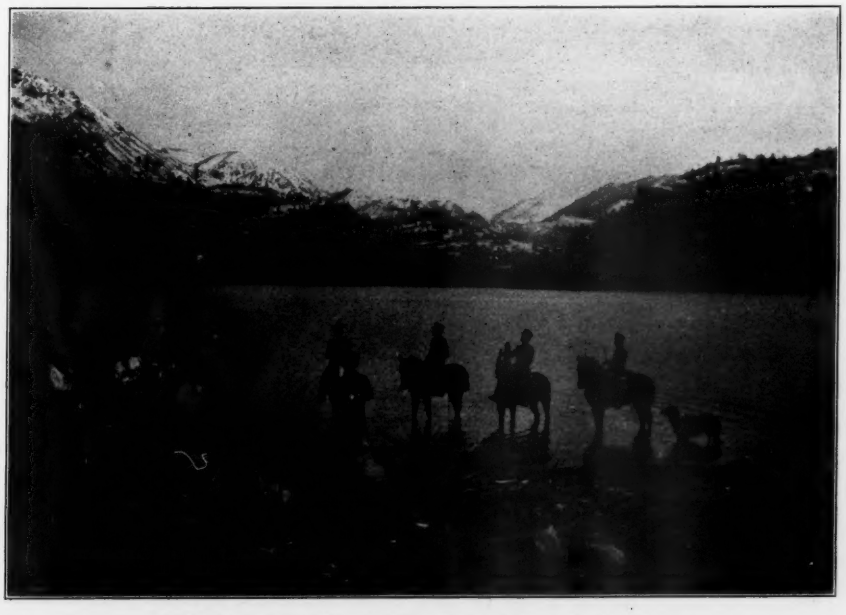
The commission which settled the boundary dispute between Argentina and Chile traversed a part of the San Martin Pass several years ago, and it seems almost incredible that the men composing it could have neglected to note the favorable conditions for a main route of transcontinental travel. An enormous pile of green bottles which was pointed out to me in the rear of the cabin in which the commission made its headquarters in this region may furnish an explanation of the carelessness of these men.

A little more than a year ago a trader, William Angemeyer, a German by birth, an American by citizenship and a Chilean by residence, traveled through the pass on horseback, and realizing its many advantages he obtained enough money to pay for a railroad survey. Even before the survey was finished a company of French and Chilean capitalists with European backing had begun the construction of a line that will be extended through the pass to San Martin de Los Andes on the Argentine pampa, where connection will be made with the Buenos Aires Southern, which began extending simultaneously from its terminus at Neuquen. Trains are now running over several miles of both extensions and a through service will be begun not long after the opening of the Uspallata line.



Chilean Portal of Summit Tunnel under Uspallata Pass.

The rainfall at the latitude of San Martin—about 40 deg.—is nearly double that at Uspallata, and the snowfall in the higher mountains is proportionately heavy. The pass, however, at its highest point hardly touches the snow belt, and the snowfall is very light, rarely lying for a week at a time. No one of the four lakes that wind their way through this break in the mountains has ever been known to freeze over.



Lake Lacar, at the Eastern End of San Martin Pass.

In a recent trip through San Martin Pass from the Chilean coast to Argentina and back again, during the coldest days of midwinter, no temperature lower than 23 deg. Fahr. was recorded, and no snow was encountered of a greater depth than 14 in. Most of the way was entirely clear of snow, that met with having been at the top of the temporary bridle trail 1,000 ft. above the pass proper.

The pass is formed by a chain of lakes, each from 20 to 40 miles long. They run nearly east and west and empty successively into each other until their waters ultimately reach the Pacific at Valdivia through the Valdivia river. There are several favorable routes of approach to the pass for a railroad, but that which is being followed is up the Rio Valdivia and the Calle-Calle and San Pedro rivers. The government railroad extends to Collilelfu, where the new line begins. The 20 miles from Collilelfu to Lake Rinhue, the first of the four lakes, has just been put in operation.

Through the pass the line will skirt the open stretches along the lakes, heavy cutting being necessary only at three or four points where the mountains rise sheer from the water. It is a fortunate circumstance that, while each of the lakes lies in a great crack in the mountains, there is enough open space along at least one side to permit of comparatively inexpensive railroad building.

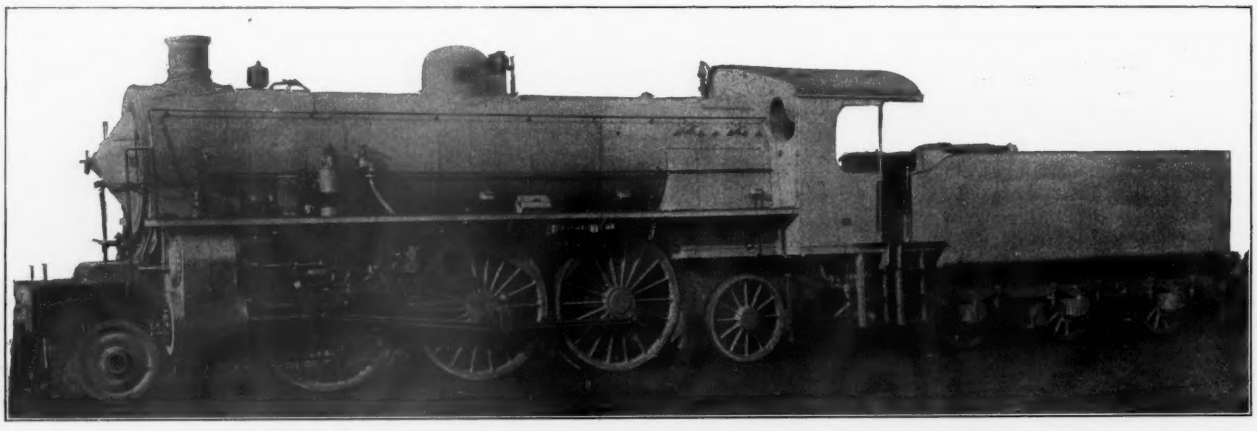
There are no new engineering problems to be solved on this route and only one piece of construction that is likely to prove costly. This is the 10 miles of grading between the lakes Panguipulli and Perihueico, which have a difference of elevation of about 1,000 ft. Some heavy rock cutting will be necessary here; also the construction of at least two, and possibly four, very high

but short bridges. On the Choshuenco river, which connects these two lakes, there is a 200-ft. waterfall of sufficient volume to furnish power to operate the railroad for 150 miles in each direction and to supply abundant power for local use.

Until the completion of the railroad, traffic through the pass is to be handled by small steamers, one of which is already in service on each of the lakes. Navigation will be shortly opened between the two upper lakes, Perihueico and Lacar, by a lock on the connecting river, and the two lower lakes may also be thus united. The traffic at present is principally cattle and foodstuffs going from Argentina to Chile.

A Balanced Compound Locomotive for the Italian State Railroads.

The accompanying drawings illustrate a locomotive embodying several features novel in express locomotive design, such as the equalized connection of the driving and pilot axles in place of a four-wheeled truck; the permissible oscillation of every axle-box in the engine about a longitudinal axis in such way as to relieve frames and axles of all strain due to diagonal movements of the one in respect to the other through the deflexion of the springs or in traversing curves; in the engine proper, the use of two piston valves distributing steam to four cylinders, each valve being independently variable in its travel by means of a duplicate reversing gear for suiting the ratios of expansion, high-pressure to low-pressure, to the widely-varying conditions of gradient and service for which these engines are intended. This ability to vary the cut-off in a balanced compound having only two valves—so differing from any two-valved engines constructed in America—is a point of great importance, for it enables machines to be set, either periodically in the shops, or by means of a second reversing gear (and in the hands of an adept engineman) to the average requirements of any section of the line. Once these requirements are ascertained by practice the duplicate reversing gear may be abandoned. Experience in nearly all the countries of Europe has shown that once the most economical working of the compound system has been determined on various sections, and a mean struck between extremes, it is safer to remove any possibility of interference with this mean at the hands of enginemen, whose duties might often interfere with a timely attention to the ratios of expansion from high to low pressure.



High Pressure Side of Four-Cylinder Compound; Italian State Railroads.

The utility of the duplicate reversing gear for operating the two valves will be appreciated from a knowledge of the fact that these engines are to work the traffic over all the most important trunk lines of Italy from Chiasso, on the Swiss frontier, to Milan, to Bologna, over the Apennines to Florence, thence to Rome and to Naples and also on the line from Florence to Pisa (Mediterranean division). The passage of the Apennine north of Florence comprises gradients of from 2.5 to 2.27 per cent. So far, it has been usual to detach the express engines at either side of the mountain and to couple at the train-head the most powerful freight engine available and to run another powerful freight engine, tender forwards and uncoupled from the cars, behind the train.

The old freight engines have just been replaced by some remarkably powerful balanced compound freight locomotives having two cranked axles, and with these aiding there is a possibility of a greatly accelerated mountain passage. It is true that it is proposed to electrify this mountain section; but in view of the fact that the electric service may break down at any time, as recently occurred for a period of three weeks on the Simplon tunnel railroad, it would be impossible to do without a powerful reserve of self-propelled locomotives at Pistoja—the foot of the mountain. Again, on the line from Florence to Rome there are continuous grades 44 miles long and gradients as great as 64.4 ft. between Orvieto and Chiusi, this rise being 6.2 miles long. Consequently, a two-valved engine, whose high and low-pressure cylinder volumes were similar to the Italian, and whose admissions were quite fixed and invariable from the very construction of the machine, as in certain American examples, could not be employed economically on the extremely variable profiles of Italian lines. By the employment, however, of greater ratios between cylinder volumes it is usual to make no difference in the cut-off of the two groups, but at very high piston speeds the total atmospheric back pressure on exceptionally large l.p. pistons may be somewhat prejudicial to free working.

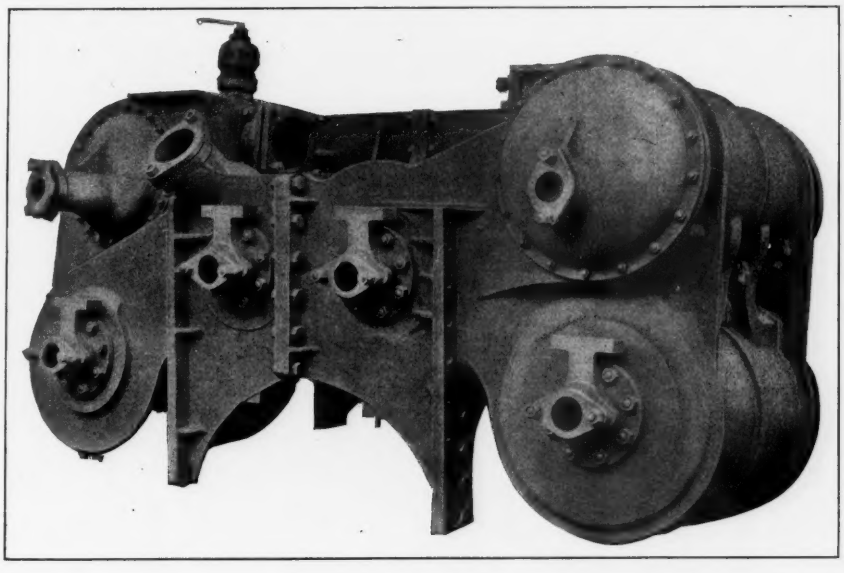
It will be seen from the drawings that the variable cut-off is made possible by the special arrangement of the cylinders: two high-pressure on one side and two low-pressure on the other side of the engine, one valve serving each group, and the opposite ends of each group of cylinders being in constant communication between themselves by means of crossed passages, so that the pressure exerted by the opposing forces of the two pistons in the same group is always and constantly equal in respect to the two cranks keyed at 180 deg. in connection with those two pistons. The balancing of the engine forces has been found to show a marked superiority by the equilibrium of steam pressures thus maintained, which is alike conducive to a regular turning moment in starting heavy trains, to a notable stability and smooth motion when speeding, and to a saving in track maintenance costs through the reduction of the wheel weights here rendered possible for the balancing of the revolving masses. The other advantages of two valves in the place of four are found also in the Vauclain compounds—that is, the passage through two valves of double the weight of steam that must traverse four valves, tending thus to efficiency in reducing variations of temperature and resulting condensations. Their internal loss by mechanical friction is naturally less than in four-cylinder single-expansion engines having four valves, and this, especially when superheated steam is employed in these latter, represents more power available for traction or for speed, and in such case the single-expansion engine becomes inferior in simplicity to the compound in consuming more steam without including the amount extra needed to overcome its own greater internal friction.

The Italian engine always works compound. It has no intercepting valve. For starting purposes there is a momentary admission of boiler steam to the low-pressure cylinders. This is entirely automatic and can only occur while the throttle is in the first stage of its opening, and only when the engine is set in full forward gear, as customary when starting a train. It just suffices to enable the high-pressure valve to obtain full admission; when the machine at once becomes quite capable, as a compound, for starting slowly any load up to 1,000 tons, or of 350 to 400 tons with rapid acceleration. The main throttle is of the Zara type, having a self-balancing action as soon as the throttle handle is moved for relieving it, first of all, of the full pressure of the boiler steam on its single seat. The lower portion of the valve is a loose-fitting piston, around the disc of which the preliminary admission of steam leaks away to the engine with the object of gradually applying the pressure, automatically, and so starting the wheels without slipping them. The succeeding phases of admission are graduated up to the moment when the throttle valve attains that full opening which is usual, from the first lifting, in all valves as ordinarily designed. The pilot valve for live steam admission to the low-pressure cylinders is connected by pipe to an extended cover on the high-pressure valve chest in which the extension spindle of the h.p. valve forms a sort of slide-valve which, when in full travel, opens the way to the receiver. From this it is obvious that back pressure from high-

pressure steam, as common in some systems of auxiliary admission, is here avoided.

The receiver referred to is a copper pipe carried around the walls of the smokebox close to the tube-sheet for the purpose of reheating the steam before entering the low-pressure valve. A "Coale" anti-vacuum valve is fitted on the top of this pipe and a relief-pressure "Coale" valve, regulated to the proper pressure, is fitted over the receiver—see left-hand side. Relief valves are also applied to all the cylinder covers.

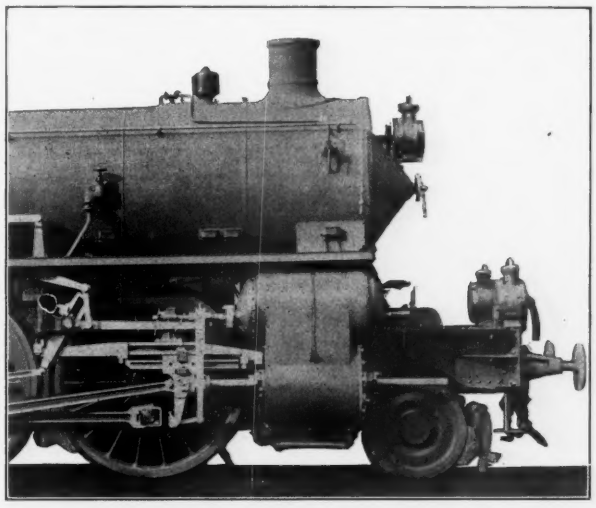
All the main driving rods work on the same axle, to effect which the inside cylinders are slightly inclined from horizontal. There can be no question that such arrangement effects a more perfect balancing than is practicable by balancing through the intermediary of side rods (or 2 x 0.5 = 1, system), and that it involves no more strain upon the cranked axle than in "divided engines" of the Webb or de Glehn order. The late Professor von Borries maintained that the efforts of the outside engines were absorbed almost entirely by the side rods and the driving wheels in connection with them. None the less, according to popular notion, "divided-engine" axles may be made of about half the strength of the single-driver axles—a fallacy at once apparent when it is considered that in the moments of the greatest stress, that is when starting a train, both single and double driver axles are equally liable to the full stress of all four pistons on one axle, and that if the divided-engine axles are really not designed to resist the torque of four pistons simultaneously then they are at a great disadvantage compared with the unicentric balanced engine. When the rear wheels of a divided-engine slip, all the power of four pistons minus that lost in skidding is applied on the front motor axle, direct or else through the side rods; and, when the front wheels alone slip, nearly the whole power is transferred to the crank pins of the rear motor axle. The same concentration of cylinder power occurs with unicentric balanced engines under the same accidental conditions, consequently it is impossible to attribute any superior equalization of the work in two-motor axles than in one-motor axles—if those axles be coupled together by side rods. In the old Webb engines and in the de Glehn engine, "No. 701," there was unquestionably an absolute division of the work at all times because their motor axles were not connected by side rods; but since rods were employed for connecting divided-motor engines no claim to any advantage over one-motor axles could be substantiated for the former. In other respects the double motor locomotive labors under real disadvantages: by the distance often separating the h.p. and l.p. cylinders as in the Webb-de Glehn-Cole types and in the constructive complication ensuing therefrom. In the Italian engine the crank axle is of the Z type of square section, forged in nickel steel, bored out hollow in all parts save the oblique arm. The mechanical details are best studied in the drawings given, but it may be remarked here that all the riding springs in the locomotive are compensated with levers from the third to the fifth axle while the leading driver has a single traversing spring.



Perspective View of Cylinder Casting.

The pilot truck frame is connected or equalized with the leading pair of driving wheels so as to form, with these latter, a four-wheeled truck, which is said to be practically equivalent in function to the ordinary four-wheeled pilot for high speeds. The arrangement is based upon the Krauss-Helmholtz equalized truck which has been in use for many years for fast suburban trains in Bavaria. The Italian arrangement for fast express engines differs from the Krauss in that, by the use of a swing bolster instead of a fixed pivot, any difference which may arise between the pilot and leading driving wheels, when on a sharp curve, as to which shall yield at either end of the fulcrum lever, is decided by the action of the swinging bolster which accommodates such differences.

The designer of this locomotive, Signor G. Zara, first applied this arrangement to the electro locomotors which he designed for the Valtellina electric railway [electric equipment by Ganz, of Budapest], and the Zara model was afterwards copied in the electro locomotors now operating in the Simplon tunnel by Brown, Boveri & Co. This form of equalized pilot truck, having proved successful for the electrical motors, has now been adopted extensively for Italian locomotives.

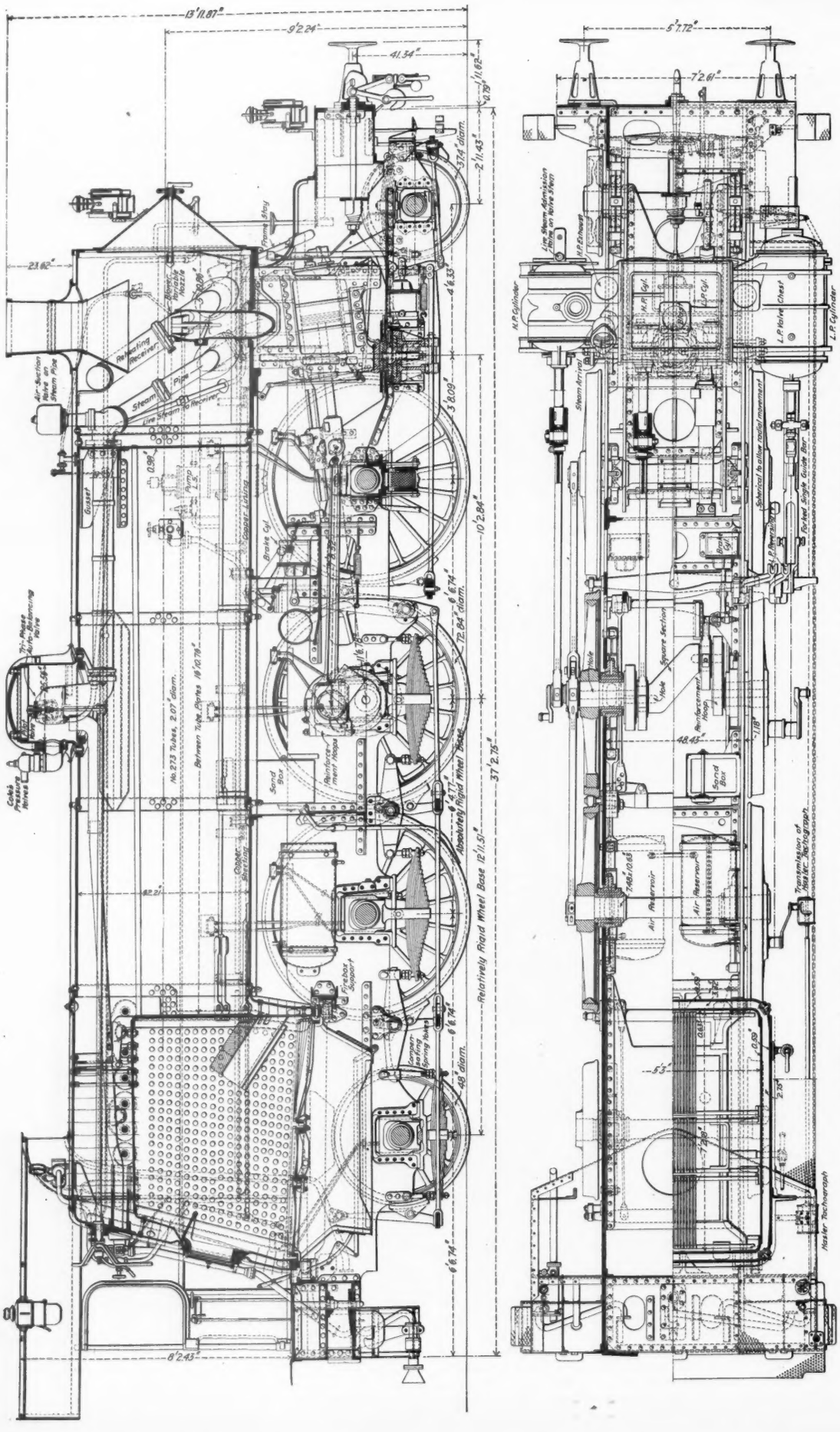


Front End of Low Pressure Side of Four-Cylinder Compound; Italian State Railroads.

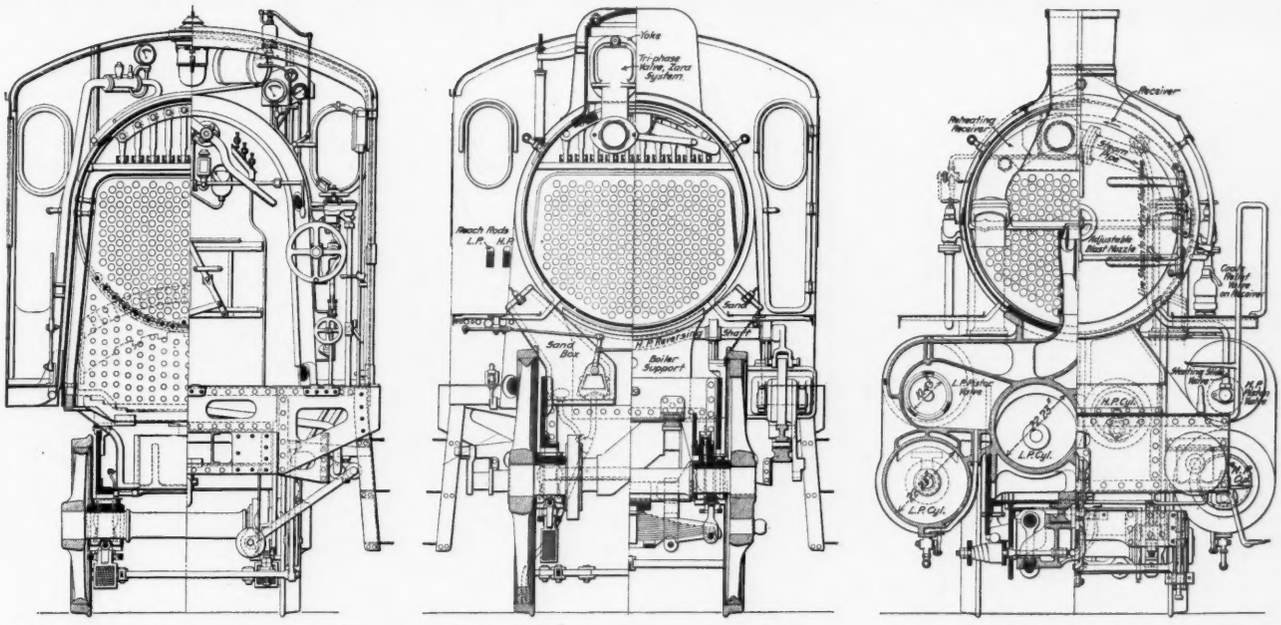
The right-hand photographic view shows one of the reversing rods, the position of the other being visible in the cross section showing the cranked axle. The left-hand view is a little more complicated by the addition of the Westinghouse air pump and the oil-feed pump. The compressed air reservoirs are concealed by the deep frames, near the firebox, and the sand boxes have the form of a saddle below the boiler and are readily accessible from both sides of the engine. It is worth notice that the brake blocks are only applied at the backs of the wheels where they relieve the strain on the axle boxes when in use.

In addition to the dimensions figuring on the plans the following may be given: Boiler pressure, 227 lbs. per sq. in.; grate area, 37.63 sq. ft.; total heating surface, 2,537 sq. ft.; weight, empty, 135,300 lbs., loaded, 151,250 lbs.; maximum for adhesion, 95,700 lbs. This latter is the maximum driving-wheel load allowable on Italian express engines until the roads are reconstructed. Any additional adhesion would call for a novel type of express locomotive having eight connected drivers. The present engines represent the power limits for such light wheel loads, and in this respect are instructive as showing the maximum of power obtainable in a minimum weight, and in a short length adapted for existing turntables throughout the Italian railroad system. They are designed for express speeds of up to 75 miles per hour with trains of up to 400 metric tons, or with fast accommodation trains of 450 tons. With the international trains-de-luxe they are found to pick up, easily, 30 minutes, and more, lost in delays during a run; and their boilers generate an abundance of steam in respect to the very economical steam consumption by the engines, although the Welsh coal employed in these new boilers—not reversed on the frames as heretofore—only evaporates, on the best average, 7.5 lbs. of water for each pound of fuel.

The new locomotives were built by the firm, Società Italiana Ernesto Breda, of Milan, and the delivery of the engines was made in the presence of the Director-General of Italian Railroads with exceptional attention and formality. Some of the more important

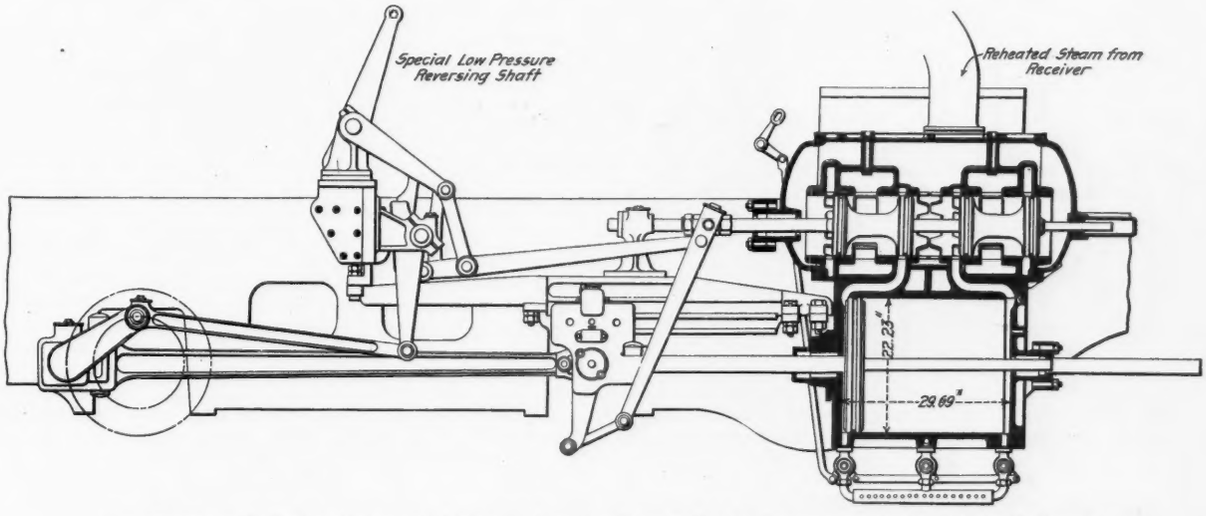


Longitudinal Section and Plan Section of Four-Cylinder Balanced Compound Locomotive for the Italian State Railroads.

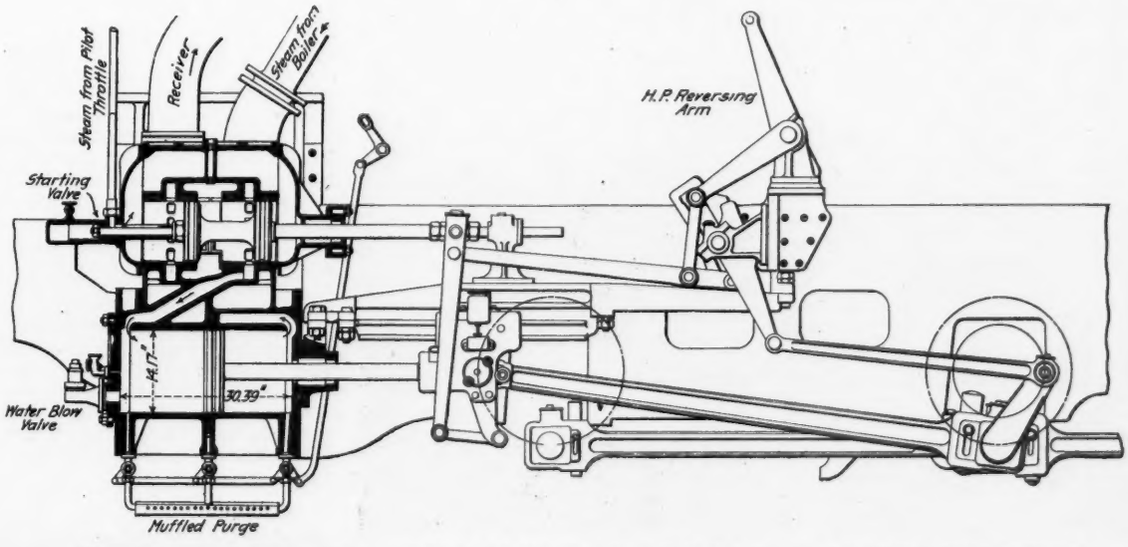


Half Section at Firebox and Rear Elevation. *Half Section and Main and Front Driver.* *Half Section at Smokebox and Front Elevation.*

Sections of Four-Cylinder Compound Locomotive for the Italian State Railroads.



Low Pressure Cylinder, Valve and Valve Motion for Four-Cylinder Compound; Italian State Railroads.



High Pressure Cylinder, Valve and Valve Motion for Four-Cylinder Compound; Italian State Railroads.

of the dimensions of these engines and the ratios between them are as follows:

Cylinder, diameter, h. p.	14.17 in.
Cylinder, diameter, l. p.	22.23 "
Piston stroke	25.59 "
Steam pressure	227 lbs.
Heating surface, firebox	112 sq. ft.
" " tubes	2,425 "
" " total	2,537 "
Grate area	37.63"
Wheels, diameter, drivers	72.84 in.
" " trailing	48.00 "
" " front truck	37.40 "
Weight on drivers	95,700 lbs.
Weight, total, in working order	151,250 "
Tubes, number	273
" diameter	2.07 in.
" length	16 ft. 10.76 "
Tractive power	20,612 lbs.
Ratio, high to low-pressure cylinders	1 to 2.46

$$\frac{\text{Weight on drivers}}{\text{Tractive power}} = 4.64$$

$$\frac{\text{Total weight}}{\text{Tractive power}} = 7.34$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = .63$$

$$\frac{\text{Tractive power x diameter drivers}}{\text{Heating surface}} = 571.64$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 67.42$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 4.41$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 37.72$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 59.62$$

Volume 2 h.p. cylinders ..... 4.66 cu. ft.

$$\frac{\text{Total heating surface}}{\text{Volume of h.p. cylinders}} = 544.42$$

$$\frac{\text{Grate area}}{\text{Volume of h.p. cylinders}} = 8.08$$

Tube heating surface equated to firebox heating surface	590 sq. ft.
Total equated firebox heating surface	702 "

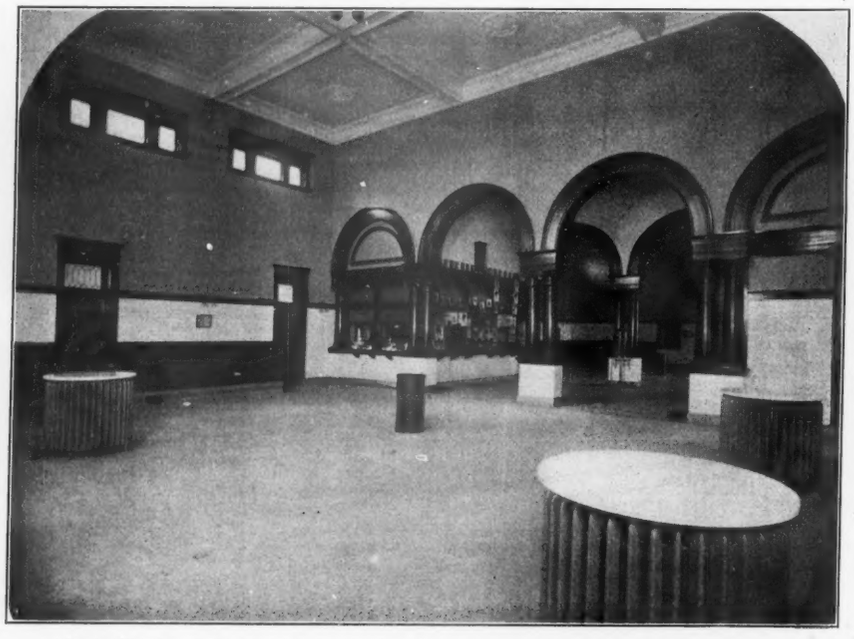
New Union Station for Three Roads at Waco, Tex.

The new union station recently built by the St. Louis Southwestern at Waco, Tex., is shown in the accompanying illustrations. The other roads which use the station are the International & Great Northern and the San Antonio & Aransas Pass. The St. Louis Southwestern and the International & Great Northern previously used jointly a small one-story frame station on Third and Mary streets, on the north end of the block which the new terminal now occupies. The San Antonio & Aransas Pass had a separate station of its own about half a mile away.

The new station is at the corner of Fourth and Mary streets, in the business center of the city, and four blocks from the Brazos river. It is 145 ft. x 70 ft. outside, the long dimension being on Mary street, and a covered platform 60 ft. wide extends through to Third street over the site of the old station.

The building material is red brick faced with buff brick, the trimmings being gray stone. The tower is 19 ft. square and 70 ft. high. The roofs are covered with black Bangor slate and all ridges and hip rolls are trimmed with buff terra cotta. The interior has two general waiting rooms, for whites and negroes respectively, each 41 ft. x 49 ft.; ticket office, 16 ft. x 16 ft.; ticket lobby, 19 ft. x 25 ft.; women's retiring room (white), 17 ft. x 22 ft.; men's smoking room (white), 17 ft. x 24 ft.; and smoking and retiring rooms for negro men and women, 12 ft. x 17 ft. each. The baggage room, at the north end of the building, is 26½ ft. x 41¾ ft., and adjoining it is the express room, 21 ft. x 23 ft. 10 in.

Union Passenger Station Built by the St. Louis Southwestern at Waco, Tex.



Main Waiting Room (Negroes' Waiting Room Beyond); Waco Station.

The two general waiting rooms are connected with plastered arches and colonial columns. The walls in the general waiting rooms are wainscoted 8 ft. high with Tiffany white enameled brick. Above the wainscot the walls are plastered with Acme cement tinted gray. The ceilings over the waiting rooms are plastered and have heavy beams and cornices in 12-ft. squares. The height of the ceilings in the waiting rooms and ticket lobby is 25 ft. and in the other rooms 14 ft. The floors in the waiting rooms, lobby, toilet and smoking rooms are Venetian mosaic, finished around the walls with a sanitary base of terrazo marble. The building is heated by steam and lighted by electricity.

The street, driveways and inter-track spaces are all paved with vitrified brick on a foundation of concrete. The cost of the terminal, including street paving and necessary track changes, was approximately $60,000. The plans were prepared in the office of J. S. Berry, Superintendent of Bridges and Buildings of the St. Louis Southwestern, and all work was done by company forces. We are indebted to F. H. Britton, President of the St. Louis Southwestern of Texas, for the information.

Chinese authorities have decided that all railroads built by Chinese shall revert to the government 25 years after they are opened.

GENERAL NEWS SECTION

NOTES.

The legislature of Alabama has appropriated $50,000 to pay the expenses of resisting the suits which have been begun in the courts by the railroads to secure the annulment or modification of the rate laws recently passed.

The Railroad Commissioner of Michigan has sent to all of the roads in the state a letter calling attention to the necessity of good locks on switches. He has found many unlocked switches and some which have no locks.

Complying with a recent state law, the Pennsylvania Railroad has remeasured its main line, and the distance between Philadelphia and Pittsburg will hereafter appear on the time tables two or three miles less than heretofore.

According to a press despatch from Cleveland, a strike of union boilermakers in the shops of the Lake Shore & Michigan Southern Railway at Elkhart, Ind., has been settled by the company's agreeing to entirely abolish the piecework system.

An order recently issued by the Texas State Railroad Commission, requiring the Southern Pacific to run double daily passenger trains between San Antonio and Victoria, has been suspended by a restraining order from the District Court.

Somebody in Texas has estimated that the more elaborate accounts which must henceforth be kept by the railroads in compliance with an order of the State Railroad Commission, will cost the companies $300,000 additional yearly for clerical help.

Western papers say that the railroads between Chicago and Kansas City have decided to reduce the time of their through express trains from nine hours to eight hours 30 minutes. The time of these trains was lengthened from eight and one-half hours to nine hours a few months ago.

The Public Service Commission of the Second District of New York State has ruled that railroads may sell round trip excursion tickets to the state fair at Syracuse, with a coupon giving admission to the fair grounds; but a passenger must not be compelled to buy the admission ticket in order to secure the excursion rate.

The legislature of New York has passed a bill, which has been signed by the Governor, repealing the clause in the franchise tax law under which railroad grade crossings in first-class and second-class cities are exempted from liability to the franchise tax. This means that the right of a railroad to cross a street is to be regarded as property and may be assessed for taxation.

The presidents of a number of important railroads met at the office of President Underwood of the Erie in New York City last week and discussed the question of abandoning excursions in order to increase their income, with a view to counteracting in some degree the reduction caused by the recent enactment of 2-cent rate laws by several states; but no action was taken, each road being left to act for itself.

The state of Connecticut has passed a law, similar to the federal law, limiting the working hours of railroad telegraph and telephone operators. At offices which are not open at night the operator may work 12 hours, but at other places the ordinary limit is eight hours a day. The only exception to this is in cases of "sickness, death, wrecks or washouts." The penalty for disobedience is $1,000 fine, or ten times as much as the fine prescribed in New York State.

A new line of steamers from Vancouver, B. C., to the west coast of Mexico, subsidized by the Canadian and Mexican governments jointly, is now in operation. The steamship Georgia has made one voyage from Vancouver south to Salina Cruz, the western terminus of the Tehuantepec National Railway, stopping at intermediate ports. There was little or no cargo at Vancouver for this first voyage, so that the vessel was loaded at Puget Sound ports.

The new laws of the State of Texas, requiring a certain number of brakemen on trains and requiring the use of electric headlights on locomotives; and regulating the working hours of trainmen and telegraphers, went into effect July 12. Mr. Van Vleck, of the Southern Pacific, is reported as saying that on his road the headlights alone will cost about $200,000; while the increase in wages and the cost of changing terminals, in consequence of the limitation of working hours of trainmen, will for the whole state and for all the roads run up into the hundreds of thousands.

The Wabash has reconsidered its decision to establish a passenger rate of 2 cents a mile in all territory east of Chicago. As the only road having lines both east and west of Chicago, the Wabash is a member of both the Western and the Central Passenger Associations. It found itself making 2-cent interstate rates in the territory west of Chicago and 2½ and sometimes 3 cents east. This led to a notice of intention to make a uniform rate of 2 cents a mile, but it is now announced that interstate rates are not to be disturbed, except in cases where the through rates exceed the sums of the local rates.

The committee on car efficiency of the American Railway Association his issued a statement showing surpluses and shortages of revenue freight cars on July 10 on all of the principal roads. These figures show the conditions as to over and under supply of cars as reported to the committee without regard to the number of cars owned. By comparison with February 6 last, the date showing minimum surpluses and maximum shortages since such figures have been compiled, it is found that July 10 shows an increase in surpluses of 37,459 and decrease in shortages of 85,739 cars, or a net improvement of 123,198 cars for an average of 79 roads.

An advance of 20 per cent. in freight rates recently announced by the Metropolitan Steamship Co. has raised the level of water rates between Boston and New York to a parity with the all-rail rates. It is said that the tendency in the last few years among coastwise steamship companies has been to lessen constantly the margin of difference between competitive rail and water rates. The New Haven water lines for several years have been gradually increasing the rates on the Providence and Fall River boats to New York, until at present there is no practical difference in the cost of freight between the rail and water lines. It is said that the advances in water rates have been due to the increased cost.

A lumber manufacturer in the Northwest says that his inability to promptly fill orders for carload shipments, which, a few months ago, was due to a scarcity of cars, is now due to a scarcity of cars of the right kind; that is to say, the railroad, according to this shipper, has enough cars standing around his station to take all of his lumber, if only they could be used; but the road will not allow its own cars to be sent off its own line, and the other cars which are standing there empty cannot be sent to the points to which the lumber is destined. In other words, the railroad has begun to comply with the rule which forbids sending foreign cars in a direction opposite to that which will take them home—a refreshing revival of conscience.

Out of 1,196 surprise tests on the Union and Southern Pacific in a recent month, in only 16 cases did enginemen fail to observe signals. Eighteen different tests were applied, besides special tests. All red flags, crossing, station and block signals were observed. This is the fourth year of surprise tests on the Southern Pacific and the third year on the Union Pacific lines. Tests are made in person by each division superintendent and his subordinates, and the general superintendents and general managers are required to make a number of surprise tests every month. Two or more of each of 18 different kinds of surprises must be made on each division each month. These tests cover the use of torpedoes, fusees, slow and red flags, switch lights out and at danger, and all semaphore signals.

According to a press despatch from Chicago, the Post Office Department has decided that on the railroads west of that city it can save $1,000,000 a year by occupying less room in the mail cars on the railroads; and the railroads have been notified of the purpose of the department to make this change. Railroad officers are complaining of this, and also of the severe enforcement recently of penalties for delays. One officer says that the fines levied by the Government against his road, in one quarter, amounted to $40,000. The Department now adheres, it is said, to the rule providing that if mails are late 10 times on any route during a period of 90 days, the road shall be assessed 15 per cent. of the pay of that route for the quarter. Under the speed standards as now established it will be a marvel if any of the big Western roads escape having their important mail trains late more than 10 times in 90 days. As to car room, it is said that the Post Office Department is preparing in many cases to insist upon one size car westbound and an entirely different car eastbound. One of the Government inspectors is quoted as telling a railroad official that this was being done because of the knowledge that, rather than deadhead cars over their routes, the railroads would in all such cases use the larger car both ways, whereas the Government would have to pay for the larger size car in only one direction.

English Excursions.

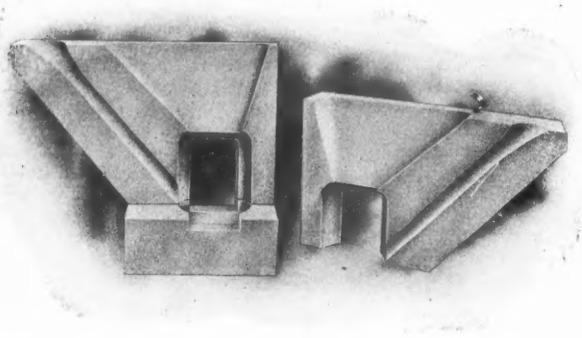
An excursion run from Burton-on-Trent to Blackpool, England, on July 19, for the employees of Bass, Ratcliff & Gretton, brewers, filled 17 special trains, all of them starting between 4 and 6:45 a.m. The distance traversed was 121 miles, the journey covering parts

of four different railroads. The whole expense of the excursion was borne by the employers, including side trips in steamers and admission to all the Blackpool shows.

On the excursion of the employees of the Great Western Railway from Swindon, the first week in July, over 25,000 people left that town for a week's holiday, the employees taking their wives and families and the town being nearly deserted. On the fifth of July 22 special trains left Swindon, all before 7 a.m. Three of these trains, carrying 4,500 passengers, went to London; five to Weymouth and the Channel Islands, with 6,000 passengers, three for Plymouth and the West, with 5,500, and four for Weston-super-Mare, with close on 5,000 holiday makers. In addition, more than 3,000 people visited South Wales, and 2,500 the North of England. The traveling arrangements were conceived in the most generous spirit, the company providing free passes for employees and their families over its own road, and tickets at reduced rates for journeys over foreign lines. The only restriction imposed was that each man must decide on his holiday resort a fortnight beforehand, in order to simplify the arrangements for transporting the vast number of travelers. The special time table issued for this occasion fills 16 pages.

Welding Locomotive Frames with Thermit.

The Goldschmidt Thermit Co., 90 West street, New York, has recently developed a new and simple method for welding locomotive frames which employs fire brick moulds instead of the usual sand mould. These moulds are shown in the accompanying illustrations. They are made in three parts, two side pieces and a bottom piece, the necessary gate and riser being formed in the moulds, as well as the collar around the fracture. They are made in four sizes for frames from 3 in. wide and 4 in. deep to frames 5 in. wide and 6 in. deep. For intermediate sizes the bricks can be cut to fit. In welding frames the fracture is prepared in the usual way by drilling 1 in. holes along the line of the break and jacking the

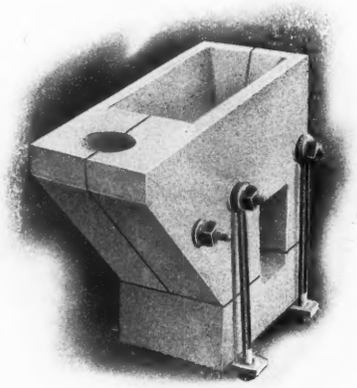


Parts of Firebrick Mould for Welding Locomotive Frames.

Mould and Crucible Ready for Pouring.

parts open from $^1/_{16}$ in. to $\frac{1}{8}$ in. The contact surfaces of the right-hand and left-hand bricks are covered with a thin layer of fire clay and then bolted together around the fracture. The contact face of the lower brick is coated with clay and squeezed up against the side bricks and then the openings around the frame are carefully luted by squeezing in fire clay. The mould is surrounded with a sheet iron or wooden box which is filled with sand and thoroughly tamped as an additional precaution against the escape of molten steel. The crucible is placed in position over the pouring gate and the charge melted and poured in the usual way after the mould and frame have first been heated red hot. The use of these standard moulds eliminates much of the preliminary work which was formerly necessary and allows the welding to be done quickly and accurately. The moulds are furnished at the uniform price of $5 a set of three pieces. They can only be used once.

Where the fracture is located in a part of the frame which makes it impossible to use these standard moulds a simple process of making the mould out of green sand has been developed. Yellow



Frame Mould Assembled.

wax is used as a pattern or matrix for the casting and is shaped around the fracture in the form of the collar desired. The mould box is then placed in position and moulding sand, consisting of a mixture of fire clay and sand, is tamped around the matrix in the usual manner except that a small hole is left in the lowest part of the mould. The patterns for gate and riser are made of wood and placed in the mould in the usual way. After the mould box is filled and tamped the gate and riser patterns are withdrawn and a torch applied through the riser. The intense heat melts the wax matrix which runs out through the opening at the bottom. The heat is continued until the metal is red hot and the mould is thoroughly dry, after which the opening at the bottom is closed with a sand core. Pouring is then performed in the regular way.

Test of Holmes Rod Packing.

A thorough test of Holmes' metallic packing, made by the Holmes Metallic Packing Co., Wilkesbarre, Pa., was recently completed by the Philadelphia & Reading. An eight-wheel switch engine, No. 1,356, built by the Baldwin Locomotive Works, was equipped on February 11, 1906, with Holmes' metallic packing applied to the left piston rod and right valve stem and the opposite rod and stem were packed with other packings. The locomotive was worked 24 hours a day for seven days in the week with a steam pressure of 205 lbs., and, during the 16 months ending June 8, 1907, made over 75,000 miles. At the end of that time the rod and stem packed with the Holmes' metallic packing was absolutely steam tight and both the rods and the packing were in perfect condition. The piston rod had been reduced less than $^1/_{64}$ in. in diameter. The packings on the opposite rod and stem during the same period were renewed 41 times, eight new sets of packing being applied during one month, December, 1906. The rod required turning with a reduction in diameter of $^5/_{64}$ in.

The Yale & Towne Triplex Hoist.

It will be observed in the upper photograph on page 71 of the *Railroad Gazette* of July 19, 1907, illustrating an article on "The New Blacksmith Shop of the Union Pacific at Omaha," that a Yale & Towne triplex chain block is in use holding a locomotive frame in front of the frame fire. These hoists are made by the Yale & Towne Manufacturing Co., New York city.

New Warehouse at Newark for the Central of New Jersey.

On August 1 the Newark Warehouse Company, a subsidiary company of the Central Railroad of New Jersey, opened a large new building at Mechanic, Lawrence and Ward streets, Newark, N. J., for handling freight coming to and from the city on the New Jersey Central. Cars will be switched into the ground floor of the building, where their contents will be unloaded and raised by a complete elevator system of 14 elevators and eight gravity conveyors

to the floors above or unloaded directly onto trucks. The whole building is made of reinforced concrete. It occupies a city block, is six stories high and has 370,000 sq. ft. of floor space. Six thousand tons of steel were used in its construction. Fifty freight cars can be accommodated on the tracks inside the building, which has room for the storage of 12,200 carloads of freight.

Exports Through Atlantic and Gulf Ports.

The *Wall Street Journal* publishes the following figures of grain exports through the Atlantic and Gulf ports, compiled by the traffic department of the Chicago Board of Trade. The figures are for the years ended June 30, 1906 and 1907.

Grain Exports for Two Years.

	Corn		Wheat.	
	1906.	1907.	1906.	1907.
Boston and Charlestown	6,769,128	4,693,998	297,542	2,622,505
Portland and Falmouth	401,148	149,732	967,767	1,189,815
New York	24,528,389	21,761,363	7,504,594	18,679,225
Philadelphia	11,684,663	6,368,221	1,201,980	8,391,450
Baltimore	26,237,722	19,917,037	1,609,578	5,026,578
Newport News, Norfik, Prtsmth	4,421,564	1,930,544	160,000	943,359
Total	74,042,614	54,820,895	11,741,461	36,852,932
Galveston	13,643,529	5,693,304	3,816,916	14,172,021
Mobile	1,904,091	2,397,970	140	862
New Orleans	18,881,433	8,236,918	1,521,354	5,496,955
Total	34,429,053	16,328,192	5,338,410	19,669,818
Percentage via Atlantic ports	68.26	77.05	68.74	65.2
Percentage via Gulf	31.74	22.95	31.26	34.8

Although the proportion of wheat exports via Atlantic ports declined, the proportion of flour exports increased, being 86.83, as against 81.84 in the 1906 crop year. The flour totals in barrels follow:

	Seaboard.		Gulf	
	1907.	1906.	1907.	1906.
Exports	8,980,128	8,065,998	1,361,260	1,789,837
Per cent.	86.83	81.84	13.17	18.16

Third Class Passenger Cars in Canada.

The Canadian Railway Commission has ordered the Grand Trunk Railway to have third-class carriages put on its trains throughout the entire system in Canada. The road has the right to appeal from the order to the Supreme Court. Third-class would probably mean a general rate of 2 cents a mile.

Record Earnings of the United States Steel Corporation.

The net earnings of the United States Steel Corporation for the second quarter of 1907 (April 1 to June 30) were $45,503,705 against $41,750,125 in the previous high record quarter, which was that ended December 31, 1906. The net earnings for the six months ended June 30, were $84,626,197. This compares with the first half year's net earnings of previous years as follows:

1906	$76,759,523	1903	$61,568,235
1905	53,331,012	1902	64,377,500
1904	32,699,611		

The unfilled orders on hand June 30, 1907, amounted to 7,603,878 tons, somewhat less than at the ends of the last three quarters. The falling off in new business in July as compared with July of last year is estimated at 25 to 30 per cent.

Carrying Coals to Newcastle.

The people of Tonawanda, N. Y., had their curiosity aroused recently by the appearance at that port of a steamer flying the Norwegian flag. It was the "Polleux," loaded with 860,000 ft. of spruce lumber from St. John, N. B., consigned to a wholesale lumber dealer. This is nearly the same as carrying white pine to Michigan, and serves as a reminder that "times have changed."

INTERSTATE COMMERCE COMMISSION RULINGS.

Rate on Cotton Waste from Augusta, Ga., to New York, Reduced.

Commissioner Clements has announced the decision of the Commission in the case of Riverside Mills v. Southern Railway et al. It appeared that defendants' rate on cotton waste, a by-product of cotton goods, in bales, from Augusta, Ga., to New York, is 41 cents per 100 lbs., or the same as the rate on cotton goods between the same points, though cotton waste has considerably less value and involves much less risk and expense in transportation than cotton goods. The Commission held that cotton waste should be carried at less rates than cotton goods, and that no higher rate than 35 cents per 100 lbs. should be charged for its transportation by sea and rail from Augusta to New York.

Rate on Cotton Goods from Augusta, Ga., to New York, Upheld.

In an opinion by Commissioner Clements decision has been announced in the case of the Warren Manufacturing Co. et al. v. Southern Railway et al. The Commission held that the absorption of a competing line of railroad by another in alleged violation of the statutes of a state or of the Sherman anti-trust act can be considered by the Commission only if it results in unreasonable rates. The long-continued carriage of any article of freight at certain rates, while establishing a presumption that such rates are reasonable and remunerative, is not alone conclusive, but to carry such presumption must show a settled practice or policy. Where a rate is comparatively the lowest in its territory on a given article of freight and by reason thereof has been made the basis of reductions from competitive points, it will not be further reduced on the ground alone that it had at stated periods in the past been somewhat lower, unless it be shown that it is unreasonably high for the service performed. In this case the rate of 41 cents per 100 lbs. on cotton goods by sea and rail from Augusta, Ga., to New York was held not unreasonable, and the complaint was dismissed.

Grain Rates from Oklahoma to the Gulf Reduced.

In an opinion by Commissioner Prouty decision has been announced in the case of the Territory of Oklahoma v. Chicago, Rock Island & Pacific et al. The complaint asked reduction of the rates on wheat and corn from all stations in Oklahoma on the lines of the defendants when moving to Galveston for export. The defendants are the various railroad companies carrying this grain from points of origin in Oklahoma to Galveston, the other originating roads being the Atchison, Topeka & Santa Fe; Gulf, Colorado & Santa Fe; St. Louis & San Francisco, and Missouri, Kansas & Texas. The other defendants are railroads which receive this traffic at various junction points and carry it to destination. The Commission found that defendants' rates on wheat and corn from points in Oklahoma to Galveston for export are unreasonable and ordered them reduced.

The Basing Point System Upheld.

In an opinion by Commissioner Clements, decision has been announced in the two cases of the Commercial and Industrial Association of Union Springs, Ala., v. Louisville & Nashville et al., involving the reasonableness of rates from St. Louis, Nashville and Memphis to Union Springs as compared with the rates from the same points of origin to Columbus, Ga., and Montgomery, Eufaula and Opelika, Ala. No basis was found for a conclusion that the rates to Union Springs are unduly discriminatory, nor for a conclusion that the rates are unduly high in themselves. The Commission held that in a territory where the basing point system has been in operation since the advent of railroads, rates to a complaining point made by a combination of the through rate to the nearest trade center and the local rate beyond, need not, under the construction of the fourth section of the Act by the Supreme Court, be reduced to the basis of every neighboring point of like distance when the other points in the group whose rates are desired have the advantage of water or other competition. The complaint was dismissed.

Compression of Cotton in Transit.

The case of the Commercial and Industrial Association of Union Springs, Ala., v. Central of Georgia has been decided in an opinion by Commissioner Clements. This case involved alleged undue discrimination against Union Springs in the privilege of compression of cotton in transit. Complainant alleged that defendant refuses to apply the through rate from points of origin to points of ultimate destination on cotton shipped into Union Springs, there compressed and again shipped out, and that defendant being interested in compresses at other points favors such other points in hauling cotton there for compression. The Commission held that the testimony does not support the first alleged discrimination. The facts developed as a basis for the second alleged discrimination were conceded to be in a measure true, but whether compression of cotton in transit should be considered an incident of transportation, and therefore a matter wholly within the discretion and control of a carrier as to the instruments employed, neither the grower nor the consumer being directly interested, the Commission declined to decide without a general investigation covering the whole field of production and markets. Such a question cannot be determined on an insufficient inquiry at a single point. The complaint was dismissed.

MANUFACTURING AND BUSINESS.

J. W. Taylor, Jr., is associated with J. H. Burwell, Fisher building, Chicago, representing Edward H. Smith & Co., the Seeger-Gallasch Refrigerator Co., and the Automatic Ventilator Co.

The Vredenburg Company, 1332 Monadnock block, Chicago, was recently organized to take charge of the advertising of engineering, contracting and manufacturing companies. The manager, Clar-

ence Vredenburg, was editor and manager of *Engineering World* from its beginning until its recent sale.

The Atlantic Coast Line has installed in its shops at South Rocky Mount, N. C., a five-ton, three-motor, 72-ft. span electric Northern traveling crane made by the Northern Engineering Works, Detroit, Mich.

Iron and Steel.

The Lake Superior Corporation has taken a contract for 21,000 tons of rails for a Canadian road.

It is estimated that the mills have on their books orders for more than 2,000,000 tons of rails, over half of which is for 1908 delivery.

The New York, New Haven & Hartford and one or two other eastern roads are in the market for an aggregate of 2,000 tons of bridge material.

The American Bridge Company has orders for 15,000 tons of structural steel for the Portland & Seattle and for 350 tons for the Delaware & Hudson.

The McClintic-Marshall Construction Company has orders from the St. Louis & San Francisco for 3,000 tons of structural steel for new shops at Springwell, Mo., and from the Western Pacific for 2,000 tons of bridge material.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Corvallis & Eastern.—J. W. Newkirk has been elected Treasurer, with office at Portland, Ore., succeeding G. W. Talbot, resigned to go to another company.

New Orleans & North-eastern.—See New Orleans Terminal.

New Orleans Terminal.—D. D. Curran, President of the New Orleans & North-eastern, has been elected also President of the New Orleans Terminal.

St. Joseph & Grand Island.—See Virginian Railway.

Virginian Railway.—F. W. Russell, Secretary of the St. Joseph & Grand Island, has been elected Secretary of the Virginian Railway, with office at Norfolk, Va., effective August 15.

Wisconsin State Railroad Commission.—John Barnes, Chairman, has resigned.

Operating Officers.

Boston & Maine.—G. H. Folger, Superintendent of the Boston Terminal division, has been appointed to the new office of Assistant General Superintendent. G. L. R. French, Assistant Superintendent at Springfield, Mass., succeeds Mr. Folger. W. H. Ford, Assistant Superintendent at Lyndonville, Vt., succeeds Mr. French. George W. Cree succeeds Mr. Ford.

Chicago & Alton.—W. B. Causey, Engineer of Maintenance of Way at Bloomington, Ill., has been appointed Superintendent at that place, succeeding W. L. Derr, resigned to go to another company.

Mexican Central.—E. R. Walter has been appointed Acting Superintendent of the Chihuahua division during the leave of absence of W. T. Provence. S. J. Ross has been appointed Acting Superintendent of the Coahuila & Pacific and Saltillo divisions.

Mexican Southern.—W. L. Morkill, General Manager, has resigned, effective early next fall, to go to a company in Peru.

Union Pacific.—H. V. Hilliker has been appointed Trainmaster at North Platte, Neb., succeeding J. F. Clabaugh, resigned.

Traffic Officers.

Boston & Maine.—A. S. Crane, Export Freight Traffic Manager, has been appointed Assistant Freight Traffic Manager, with office at Boston. T. A. Dugan, Assistant General Freight Agent at Boston, has been appointed General Freight Agent, with office at Boston. George H. Eaton succeeds Mr. Dugan. F. S. Davis has been appointed Assistant General Freight Agent at Troy, N. Y.

Cleveland, Cincinnati, Chicago & St. Louis.—N. R. Johnson, General Agent at Cincinnati, has been appointed General Agent of this company and of the Peoria & Eastern at Peoria, Ill., succeeding to the duties of H. M. Griggs, division freight agent, transferred. C. O. Stimson, assistant division freight agent at La Fayette, Ind., has been appointed General Agent at that place. See New York Central Lines.

Grand Trunk.—C. E. Dewey, division freight agent at Toronto, Ont., has been appointed Assistant General Freight Agent, with office at Montreal, Que.

New York Central Lines.—H. M. Griggs, division freight agent of the Cleveland, Cincinnati, Chicago & St. Louis at Peoria, Ill., has been appointed Assistant General Coal and Ore Agent of the New York Central Lines, with office at Cincinnati, Ohio.

Peoria & Eastern.—See Cleveland, Cincinnati, Chicago & St. Louis.

Engineering and Rolling Stock Officers.

Chicago & Alton.—See this company under Operating Officers.

Colorado Southern, New Orleans & Pacific.—H. M. Hensen, supervisor of bridges and buildings of the Denver, Kansas & Gulf, has been appointed Superintendent of Bridges and Buildings of the Colorado Southern, New Orleans & Pacific, with office at Beaumont, Tex.

Iowa Central.—W. D. Wheeler, Division Engineer at Minneapolis, Minn., has been appointed Chief Engineer of this company and of the Minneapolis & St. Louis, succeeding H. G. Kelley, resigned.

Minneapolis & St. Louis.—See Iowa Central.

Missouri Pacific.—A. C. Brower has been appointed Division Engineer at Wichita, Kan., succeeding E. C. Welch, transferred to the St. Louis, Iron Mountain & Southern.

Pennsylvania.—C. D. Gray has been appointed Assistant Master Mechanic at Ormsby, Pa.

Purchasing Agents.

Isthmian Canal Commission.—C. E. Dole is Acting General Purchasing Officer, with office at Washington, D. C.

LOCOMOTIVE BUILDING.

The Chicago & North-Western has ordered 10 ten-wheel locomotives from the Baldwin Works.

The Atchison, Topeka & Santa Fe has ordered 17 consolidation locomotives from the Baldwin Works.

The Wheeling Terminal Railway has ordered one locomotive from the American Locomotive Company.

The Butte, Anaconda & Pacific has ordered four locomotives from the American Locomotive Company.

The Philadelphia & Reading, it is said, is about to build 10 freight locomotives at its Reading, Pa., shops.

The Florida Phosphate Mine Corporation, Greenbay, Fla., is said to have ordered three locomotives from the Vulcan Iron Works.

The Sacramento Valley & Eastern, which is under construction, is in the market for locomotives. D. M. Riordan, 42 Broadway, New York, is President.

CAR BUILDING.

The Erie is reported to be figuring on new freight equipment.

The Louisville & Nashville is building at its own shops 3,000 freight cars.

The Louisiana & Arkansas has ordered one mail and baggage car from Barney & Smith.

The Canadian Pacific has ordered 500 box cars from the American Car & Foundry Company.

The Northwestern Elevated, Chicago, has ordered 40 cars from the American Car & Foundry Company.

The Illinois Tunnel Company, Chicago, is said to have ordered 500 cars from the Bettendorf Axle Company.

The Harriman Lines have ordered 250 50-ton tank cars of 12,500 gallons capacity, from the Cambria Steel Company.

The Georgia Southern & Florida has ordered one baggage and mail car and four express cars from Barney & Smith.

The Charlotte Harbor & Northern has ordered one passenger and baggage car and two coaches from Barney & Smith.

The Mobile, Jackson & Kansas City is in the market for 400 box cars of 40 tons capacity and 600 flat cars of 40 tons capacity.

The Northern Railway of Costa Rica has ordered 100 box and 100 flat cars from the Western Steel Car & Foundry Company.

The Delaware, Lackawanna & Western has ordered one baggage and mail car, one dining car and four coaches from Barney & Smith.

The Gulf & Ship Island has ordered three coaches, one baggage car, one mail and baggage car and one chair car from Barney & Smith.

The Sacramento Valley & Eastern, which is under construction,

is in the market for cars. D. M. Riordan, 42 Broadway, New York, is President.

The Mobile, Jackson & Kansas City has ordered thirty 36-ft. Hart convertible cars of 80,000 lbs. capacity from the Rodger Ballast Car Company.

The Higgins Oil & Fuel Company, Beaumont, Tex., has bought 25 tank cars of 80,000 lbs. capacity, or 10,500 gallons, from the German American Lines.

The Washington, Idaho & Montana, as reported in the *Railroad Gazette* of July 26, has ordered fifty 41-ft. flat cars of 70,000 lbs. capacity from the American Car & Foundry Company for October, 1907, delivery.

The New York Central Lines, as reported in the *Railroad Gazette* of May 31, recently ordered 11 baggage cars, seven mail and baggage cars and one passenger and baggage car from the American Car & Foundry Company.

The Chicago & Eastern Illinois, as reported in the *Railroad Gazette* of July 5, has ordered 2,000 steel underframe National dump cars of 100,000 lbs. capacity from the National Dump Car Company, for January, 1908, delivery. These cars will weigh 40,100 lbs. and will be 36 ft. 6 in. long, 9 ft. 8 in. wide and 4 ft. 6 in. high, inside measurements, and 10 ft. wide and 8 ft. 10½ in. high, over all measurements. The special equipment includes:

Brake-beams	Simplex
Brake-shoes	Streeter
Couplers	Janney
Draft rigging	Miner

The Isthmian Canal Commission is in the market for 500 all-steel double dump cars of 12 cubic yards capacity and 5-ft. gage, 100 cars for November 1, 1907, delivery at New York City, and 100 each month thereafter until all are delivered. These cars are to be 19 ft. long, 9 ft. wide and 1 ft. 10½ in. high, all inside measurements. The special equipment includes:

Axles	Open-hearth steel
Air-brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Streeter
Couplers	Tower or Chicago
Draft rigging	Miner
Journal boxes	McCord
Trucks	Arch-bar
Wheels	33-in., 600-lb.

RAILROAD STRUCTURES.

CLINTON, IOWA.—The Chicago & North-Western has let a contract for a double-track steel bridge to cross the Mississippi river. The bridge will cost $2,000,000 and is to be finished by February, 1910. It will be south of and adjoining the present single-track structure.

CLOVER BAR, ALB.—The May-Sharp Construction Company is building the piers for the Grand Trunk Pacific bridge across North Saskatchewan river.

FORT WORTH, TEX.—The St. Louis Southwestern will build a new freight house at this place which, together with team tracks and storage yard, will cost $250,000.

NEW YORK, N. Y.—The Brooklyn Rapid Transit is to build a repair shop costing $300,000.

OTTAWA, ONT.—The Grand Trunk has filed plans for a terminal station to cost $250,000 and a hotel north of the station to cost $1,000,000. Another hotel, on Nepean Point, may also be built.

PITTSBURG, PA.—The Pittsburg & Lake Erie, it is said, proposes to build a bridge over the Ohio river near this place to cost more than $1,000,000.

The Baltimore & Ohio, it is said, will build large storage warehouses and a cold storage plant at this place.

VANCOUVER, B. C.—The Vancouver, Westminster & Yukon will, according to press reports, soon begin work on the approaches to the proposed bridge over the Second Narrows. The plans for the bridge are said to have been approved by the Railroad Commission.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALBERTA WHEAT, COAL & OIL RAILWAY.—This company proposes to build from Pincher Creek Station, Alb., on the Crows Nest Pass branch of the Canadian Pacific, to oil wells owned by the Rocky Mountain Development Company and the Western Oil & Coal Consolidated Company. The company also proposes to build a spur from Pincher Creek Station to Pincher Creek on condition that the town guarantees $40,000 of its bonds.

ATLANTA, BIRMINGHAM & ATLANTIC.—This company has secured its right of way into Birmingham, together with land for yards in the city.

ATLANTIC SHORE LINE (ELECTRIC).—This company, operating a line 42 miles long from Portsmouth, N. H., to Dover and South Berwick, Me., with a branch east to York Beach, has recently completed a connecting link from York Beach north to Kennebunk 16 miles. This connects with the company's 37-mile line from Kennebunk to Cape Porpoise, Kennebunkport, West Kennebunk, Sanford, Springvale, Biddeford and Saco. By the use of connecting lines a route is formed to Old Orchard and Portland. The new line, it is said, completes a chain of electric roads from Lewiston, Me., through Boston and New York to Westchester and other towns a considerable distance beyond Philadelphia, Pa., with the exception of the break at the ferry across the Hudson river.

CALIFORNIA ROADS.—The Shelan Consolidated Copper Company and the Lamb-Davis Company, it is said, will jointly build a railroad in Chelan county up the Chumstick valley via Lake Wenatchee to the Red mountain district. The company is capitalized at $12,000,000, and it is said has $1,000,000 on hand to carry out the work.

CANADIAN PACIFIC.—It is said that this company intends to double-track its main line from Winnipeg, Man., west to Brandon, 133 miles. Work on the double-tracking of the main line between Winnipeg and Fort William, Ont., was, it was announced this spring, to be finished this year.

CLARK-ROCHEPORT RAILROAD.—Right of way has been secured for this line, which is to run southwest from Clark, Mo., to Rocheport, 24 miles. James D. Wade, St. Louis, Mo., is interested.

EAST MOLINE & CAMPBELL'S ISLAND.—Incorporated in Illinois to build a belt line from East Moline, Ill., around Moline to Campbell's Island in the Mississippi river. The Directors are: Joseph F. Porter and James F. Lardner, of Davenport, Iowa; Burton F. Peek, Cyrus E. Dietz and O. E. Childs, of Moline, Ill.

ENID, BLACKWELL & OSAGE INTERURBAN.—This company has been incorporated in Oklahoma with $1,000,000 capital stock, to build from Enid, Okla., to Pawhuska, 85 miles. Headquarters are at Enid. The incorporators are George W. Bear, Frank Bradfield, John R. Clover, S. I. Hudkins, A. W. McQuilkin, T. C. Cone and Guy S. Manatt, all of Enid.

ERIE.—Preliminary surveys have been made for a low-grade cut-off on the Delaware division, which, it is said, will eliminate many curves and will shorten the present line 34 miles.

FRANKLIN & TOWAMENSING STREET RAILWAY.—This company, it is said, has secured all the right of way for its proposed line from Slatington, Pa., to Lehighton, nine miles, and work is to be begun at once.

GRAND TRUNK.—This company, it is said, plans extensive additions to its Brockville, Ont., yards.

GRAND TRUNK PACIFIC.—It is expected that, before winter, grading will be finished to Edmonton, Alb., 740 miles west of Winnipeg, and tracks laid to a point 456 miles from Winnipeg.

GULF, COLORADO & SANTA FE.—Work is under way on the rehabilitation of the old Gulf & Interstate, which runs from Beaumont, Tex., to Galveston and was recently taken over by the G., C. & S. F.

See Corporation News.

KANSAS CITY SOUTHERN.—Work was begun near Mena, July 1, on the 120-mile cut-off to secure easier grades from Siloam Springs, Ark., south along the Arkansas-Indian Territory boundary line to Cherokee Junction, Ind. T., thence to Fort Smith, Ark., and through Sebastian and Scott counties, joining the old main line near Mena. (March 15, p. 385.)

LAS VEGAS & TONOPAH.—Preliminary surveys have been made for a line from Goldfield, Nev., to Tonopah, 16 miles. It is said that within two weeks grading will be finished on the extension from Rhyolite to Goldfield, 76 miles.

LONG ISLAND.—Work has been begun on the four-track cut-off between Glendale Junction and Woodside at the entrance to Sunnyside yard in Long Island City. (March 15, p. 386.)

MEXICAN CENTRAL.—The Atotonilco branch from Ocotlan, on the Guadalajara division, northeast to Atotonilco, 30 miles, was opened for traffic on July 1.

MEXICAN ROADS.—The Guerrero Development Company has made surveys for a road from Acapulco, Guerrero, into the interior toward Mexico City, and is asking bids for building the first 150 miles. The company owns large tracts of mineral and timber lands in Guerrero.

It is said that Rafael Arodena intends to build a road from Santa Teresa, Coahuila, on the Mexican Central, 65 miles to his cotton plantation.

MILWAUKEE NORTHERN (ELECTRIC).—Grading has been finished on this line from Milwaukee, Wis., to Port Washington, and work

is about to begin on the rest of the line from Port Washington to Sheboygan. It is expected that the road will be ready for operation early in September.

National Lines of Mexico.—It is said the Mexican Government will begin at once the construction of a new line about 365 miles long from Durango, on the Mexican International, southwest to Mazatlan, on the Pacific coast.

Pacific & Eastern.—Surveys are reported made by this company for a line from a point in Siskiyou county, Cal., north to Crater Lake, in Klamath county, Ore., 100 miles. It is said that a length of 11 miles is already in operation and rights of way are being secured. The work is being done by the company's men. W. C. Morris, President, Portland, Ore.; G. W. Donnell, Chief Engineer, Medford, Ore.

Pennsylvania Lines West.—It is said that the gravity yard to be built near Bedford, Ohio, is to have a capacity for 2,300 freight cars, instead of 1,300 as originally intended.

Quebec & Lake St. John.—The Gosford branch, from Valcartier Station, Que., to Riviere aux Pius, six miles, was opened Aug. 1.

Spokane & Inland.—The Western division was to be opened for traffic south to Colfax, Wash., on August 1. It has been in operation to Rosalia, 30 miles north of Colfax, since March.

Texas & Pacific.—Track has been laid to Eunice on the line under construction from Bunkie, La., to Eunice, 35 miles. The road, which was the Louisiana East & West, is to be operated as part of the Avoyelles division of the Texas & Pacific.

Texas Roads.—E. W. Grove and others of St. Louis, Mo., are planning a road from Kingsville, Tex., on the St. Louis, Brownsville & Mexico, to San Antonio, 150 miles. It is said that San Antonio has been asked to give a bonus of $100,000 in money, and land for terminal facilities as a condition preliminary to building the line.

Toledo & Fort Wayne (Electric).—Incorporated in Ohio with $10,000,000 capital to build an electric line from Toledo, Ohio, southwest to Fort Wayne, Ind., about 75 miles. The incorporators include: E. J. Pinney, H. J. Nord, T. C. Willard, L. A. Goldstein and J. E. Lowry.

Western Pacific.—According to press despatches, this road will be opened for business from Salt Lake City, Utah, to Steptoe, Nev., 170 miles, early in September.

Wisconsin Central.—This company, it is said, has made surveys for a belt line around the northern part of Manitowoc, Wis., ending at Buffalo and Chicago streets, where a warehouse and a car ferry transfer bridge are to be built. It is understood that the necessary property was bought some years ago.

Yankton Southern.—This company has bought the franchise and right of way of the Houston, Sabine & Red River, on which some grading has been done. (See June 21, p. 917, and March 15, p. 385.)

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—J. P. Morgan & Co., New York, have bought the unsold balance of the $26,000,000 10-year convertible 5 per cent. bonds, of which about $9,000,000 were subscribed to by stockholders and about $2,000,000 disposed of to other interests. It is said that the bonds were sold to J. P. Morgan & Co. at about 98. The bankers are offering them for sale at 100¼.

Atlantic Shore Line (Electric).—This company opened for traffic on July 21 its connecting line between York Beach, Me., and Kennebunk, 16 miles. This line connects the Southern division, which was formerly the Portsmouth, Dover & York, with the Northern division, which was formerly the Atlantic Shore Line Railway, these companies having been consolidated last year under the name Atlantic Shore Line Railroad. Almost half of the connecting link is built on private right of way. The maximum grade is 4 per cent. and the numerous culverts and bridges are of concrete or steel. The opening of this link makes it possible to travel over electric railways from New York to Bath, Me., and beyond. The road carries a heavy summer passenger traffic and has three electric locomotives for hauling freight cars. It connects with the Boston & Maine at Springvale, Kennebunk, West Kennebunk and Wells. At Cape Porpoise, near Kennebunk, it has a pier and freight-house and has leased other wharfs from the town. It is planned to ultimately establish a steamship line from this port to Portsmouth and Boston. Electricity is generated by water power at Kennebunk and Sanford, and by steam plants at Kennebunk and Kittery Point. The company is controlled by A. H. Bickmore & Co., New York. It has $700,000 4 per cent. preferred stock, $2,000,000 common stock and an authorized issue of $3,000,000 4 per cent. 20-year refunding bonds.

Baltimore & Ohio.—Earnings for June, 1907, and for the 12 months ended June 30 were as follows:

Month of June, 1907.			
Gross earnings	$7,196,085	Inc.,	$623,271
Operating expenses	4,747,839	"	526,525
Net earnings	$2,448,246	Inc.,	$96,746
Year Ending June 30, 1907.			
Gross earnings	$82,243,922	Inc.,	$4,851,866
Operating expenses	54,880,091	"	5,364,870
Net earnings	$27,363,831	Dec.,	$513,004

Buffalo & Susquehanna.—Fisk & Robinson, New York, have sold $900,000 5 per cent. equipment trust notes, dated August 11 and maturing in 20 equal semi-annual instalments. They are part of an issue of $1,200,000 and are secured on 20 locomotives, 800 steel coal and coke cars and 200 steel underframe box cars.

Buffalo, Rochester & Pittsburg.—A semi-annual dividend of 2½ per cent. on the $10,500,000 common stock has been declared payable August 15, a reduction of one-half of 1 per cent. as compared with the last semi-annual dividend. The stockholders, however, will receive as large a return on their holdings as formerly, because a dividend of 2 per cent. has been declared on the stock of the Mahoning Investment Company, which stock was distributed last December to holders of Buffalo, Rochester & Pittsburg stock to the extent of 25 per cent. of their holdings. The Mahoning Investment Company took over the coal properties of the railroad.

Central of Georgia.—See Wrightsville & Tennille.

Chicago Electric Traction.—This company has been sold under foreclosure for $330,000. The company operates 31 miles of line from Chicago to Harvey, Ill. It has been in the hands of a receiver since 1900, no interest having ever been paid on the $650,000 first mortgage 5 per cent. bonds of 1929. The road is ultimately to be merged with the Chicago & Southern Traction, which runs from Harvey to Kankakee, 40 miles.

Dublin & Southwestern.—See Wrightsville & Tennille.

Gulf, Colorado & Santa Fe.—This company has arranged for trackage rights over the St. Louis, Watkins & Gulf from Oakdale, La., to Alexandria, 38 miles, and over the Texas & Pacific from Alexandria to New Orleans, 194 miles. The Gulf, Colorado & Santa Fe is building an extension from Cravens, La., to Oakdale, 25 miles. It intends ultimately to build to New Orleans.

Houston & Brazos Valley.—It is said that this road, formerly the Velasco, Brazos & Northern, which runs from Anchor, Tex., to Velasco, 20 miles, and connects with the St. Louis, Brownsville & Mexico at Angleton, Tex., has been sold to Yoakum interests.

Interurban Railway & Terminal.—This company, which owns 83 miles of broad gage interurban road from Cincinnati, Ohio, to New Richmond, Lebanon and Bethel, is to issue $1,000,000 preferred stock, part of which will be exchanged for $900,000 of the outstanding $2,500,000 common stock, while the remainder will be used to pay off old obligations.

Mahoning Investment Company.—See Buffalo, Rochester & Pittsburg.

Pittsburg, McKeesport & Greensburg.—See West Penn Railways.

St. Louis, Brownsville & Mexico.—See Houston & Brazos Valley.

Southern.—Earnings for June, 1907, and for the 12 months ended June 30 were as follows:

Month of June, 1907.			
Gross earnings	$4,609,305	Inc.,	$315,735
Operating expenses and taxes	3,432,709	"	207,012
Net earnings	$1,176,596	Inc.,	$108,723
Year Ending June 30, 1907.			
Gross earnings	$56,657,994	Inc.,	$3,016,556
Operating expenses and taxes	44,699,282	"	4,926,143
Net earnings	$11,958,712	Dec.,	$1,909,587

Toledo, Ann Arbor & Detroit (Electric).—The property of this company, which has been in the hands of a receiver since August, 1906, is to be sold under foreclosure between September 3 and 17. It is partially built between Toledo, Ohio, and Ann Arbor, Mich.

West Penn Railways (Electric).—This company has bought a controlling interest in the Pittsburg, McKeesport & Greensburg, which runs from Trafford City, Pa., on the Pittsburg Railways, to Youngwood and Hunker, 29 miles, and has outstanding $1,030,000 stock and $1,350,000 first mortgage, 5 per cent. bonds of 1931.

Wrightsville & Tennille.—The stockholders of this company and of the Dublin & Southwestern met on August 1 to authorize the consolidation of the two roads, to increase the capital stock of the Wrightsville & Tennille from $300,000 to $600,000, and to authorize an issue of $300,000 bonds. The Wrightsville & Tennille runs from Tennille, Ga., to Hawkinsville, and it owns the entire $200,000 stock of the Dublin & Southwestern, which runs from Dublin, Ga., to Eastman, 31 miles. The Wrightsville & Tennille is controlled by the Central of Georgia.